APPENDIX 8

ATTACHMENT 1

City of Joondalup

Central Park Bushland Management Plan 2014 - 2019

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City of Joondalup

Central Park Bushland Management Plan
2014 – 2019

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Acknowledgement

Acknowledgement is given to the City of Joondalup who freely provided plans, report templates and other documentation, extracts of which form the basis of this plan.

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Acronyms

Acronym / Abbreviation	Definition
AHD	Australian Height Datum
the City	City of Joondalup
CoJ	City of Joondalup
Cwlth	Commonwealth
DAFWA	Department of Agriculture and Food Western Australia
DEC	Department of Environment and Conservation
DPaW	Department of Parks and Wildlife
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities
EWSWA	Environmental Weed Strategy of Western Australia
EPBC	Environment Protection and Biodiversity Conservation
FCT	Floristic Community Type
g	gram
GIS	Geographic Information System
GPS	Global Positioning System
IBRA	Interim Biogeographical Regionalisation of Australia
L	Litre
km	Kilometres
kmh	Kilometres per hour
mm	Millimetres
NAC	Natural Area Consulting
NRM	Natural Resource Management
NWCPAG	National Wildlife Corridors Plan Advisory Group
PMST	Protected Matters Search Tool
SCP	Swan Coastal Plain
SLIPs	Shared Land Information Platforms
URL	Uniform Resource Locator
WALGA	Western Australian Local Government Association

Executive Summary

Central Park is a reserve containing both remnant bushland and parkland areas. The site is located within the City of Joondalup occupying a total area of approximately 5.66 hectares. The need for Natural Area Management Plans has been highlighted in the City of Joondalup *Biodiversity Action Plan 2009-2019* and the *Central Park Bushland Management Plan 2014 - 2019* is designed to complement that document. The site was assessed for biodiversity and threatening processes in March and April 2012. Central Park is listed in District Planning Scheme No2 (DPS S5) for protection, on the basis of its environmental values.

One hundred and thirty eight (138) plant species from forty two (42) families were recorded on site. This included forty two (42) species of monocotyledons, ninety four (94) species of dicotyledons and two (2) cycads. Of these, thirty six (36) species were weeds and one hundred and two (102) species were natives. One species of Priority Flora (P4) was found within the park (*Jacksonia sericea)* as well as two significant flora species (*Lechenaultia linarioides* and *Hibbertia cuneiformis*).
The reserve contains 4 vegetation types, namely:

- open Tuart woodland,
- limestone Heath,
- Jarrah woodland, and
- open Marri forest.

Vegetation condition ranged from very good to completely degraded. The majority of the site was classified as in good condition rather than very good condition due to the effects of fire and subsequent weed invasion. The impact the fires have had on the reserve, have largely been negated by very active weed control measures undertaken the winters of 2012-2013. A proportion of the bush pocket in the south western corner of the site was identified as being in a very good condition as a result of not being burnt in 2011. Weed species were identified to occur mostly in peripheral areas of the site which have been affected by numerous disturbances.

A targeted fauna survey indicated that the site contains a low species diversity, which can in part be attributed to the recent fires. It is believed that as the vegetation regenerates the diversity of species found within the study site will improve.

Human access to the site was considered to be sufficient, with the reserve showing only a minimal amount of litter and track formation. Fences sustained fire damage in 2011, but since have been repaired.

It is recommended that strategies to improve the biodiversity of Central Park focus on supporting natural ‘post fire’ regeneration involving the following key management areas:

- weed control
- fire
- introduced fauna
- plant diseases and pathogens
- parkland reticulation management
- revegetation

- native fauna
- access and infrastructure
- human impacts.

Central Park is an important natural space and with sound management practices the native bushland can be enjoyed by the local community and visitors into the future.

1.0 Introduction

1.1 Background

The City of Joondalup ('the City') is situated along the Swan Coastal Plain, 30 kilometres from the Perth Central Business District. The City covers an area of 96.5 kilometres which encompasses a diverse range of natural areas including 17 kilometres of coastal foreshore, a chain of wetlands and a variety of bushland ecosystems (Figure 1). The City's southern boundary is located approximately 16 kilometres from the Perth Central Business District, and is bounded by the City of Wanneroo to the east and north, the City of Stirling to the south, and the Indian Ocean to the west.

There are a number of regionally, nationally and internationally significant natural areas located within and adjacent to the City, including the Yellagonga Regional Park, the Marmion Marine Park, the Neerabup National Park and a number of Bush Forever sites, which contain species of high conservation value. The City of Joondalup is committed to conserving and enhancing the City's natural assets to ensure the long term protection of the environment for future generations

1.2 Natural Area Management Plans

The City is developing Natural Areas Management Plans to provide strategic ongoing management of the City's natural areas and protect native vegetation and ecosystems. Environmental threats have the potential to degrade natural areas and reduce biodiversity values. Environmental threats addressed in these plans include weeds, plant diseases, fire, non-native fauna species, human impacts and access and infrastructure. Natural Area Management Plans describe the potential environmental impacts and risks of activities and environmental threats in natural areas and the associated management strategies that are implemented to minimise potential impacts.

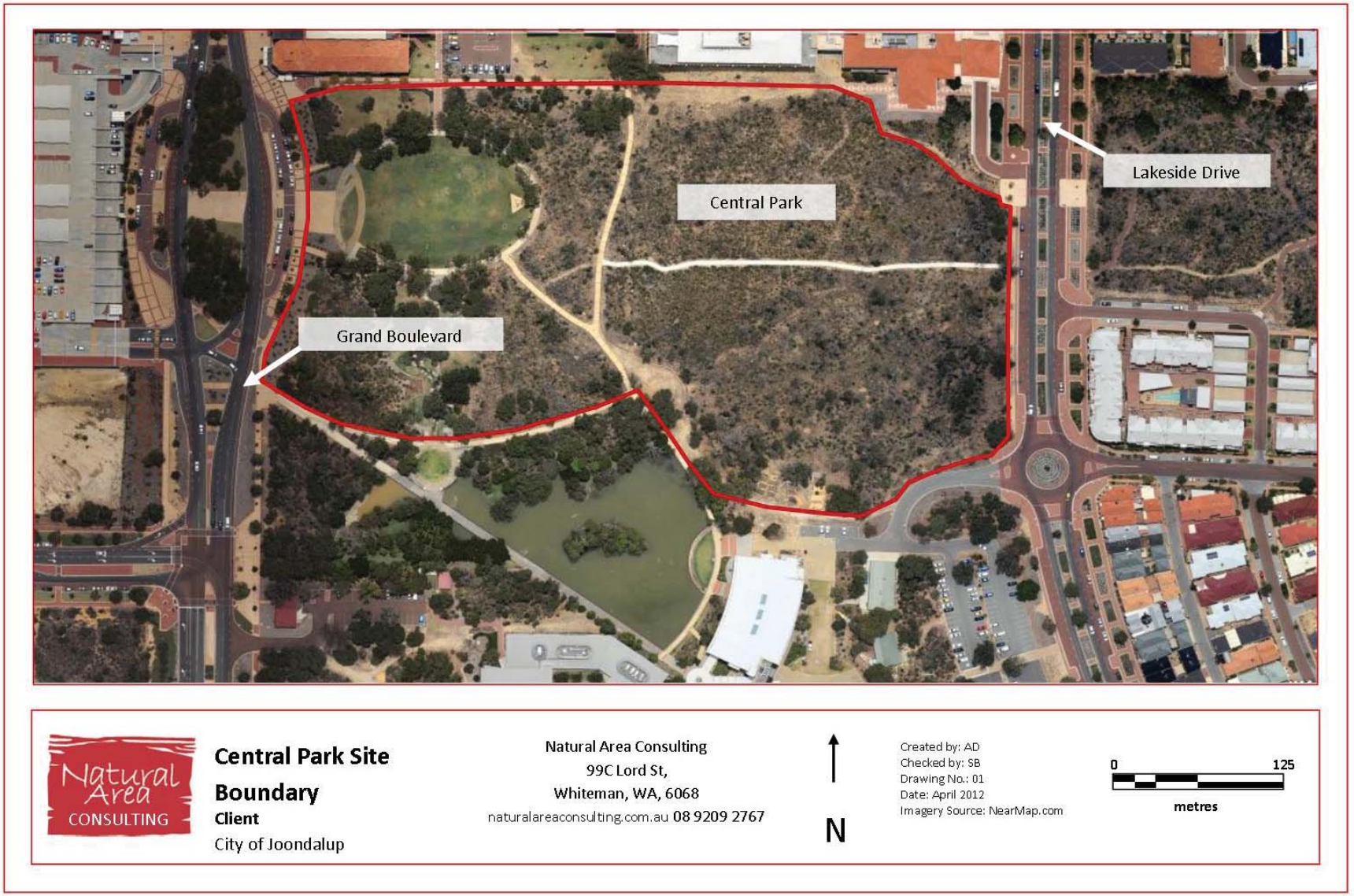
1.3 Study Area

The study area for the *Central Park Bushland Management Plan 2014 - 2019* is Central Park, Joondalup. Central Park is a pocket of remnant bushland located within the City of Joondalup occupying a total area of 5.66 hectares. It is approximately 24.5 kilometres north-west of the Perth Central Business District in the suburb of Joondalup. Central Park is bounded by Grand Boulevard to the west and Lakeside Drive to the east (Figure 2). The City of Joondalup council offices are located on the north side of the reserve along with the civic centre, the City administration offices and library. Commercial properties are located on the west and north-west side. To the east are residential properties and a bushland linkage to Lake Joondalup. The West Coast Institute of Training is to the south.

Central Park is Crown Land managed by the City of Joondalup and is reserved for the purposes of Parks and Recreation under the Metropolitan Region Scheme. The main uses of Central Park are for passive recreational purposes such as walking or dog walking or to travel to and from the educational facility and the commercial properties that surround it.

Figure 1: Location of Central Park within the City of Joondalup

Figure 2: Central Park Site Boundary



1.4 Purpose

The purpose of the *Central Park Bushland Management Plan 2014 – 2019* is to:

- provide information to assist the City of Joondalup in prioritising maintenance schedules
- guide the future development of the City's Conservation Capital Works Program
- increase opportunities for grant funding by having a detailed schedule of projects
- provide guidance to City employees and contractors and volunteers operating within Central Park.

1.5 Aims and Objectives

The aims of the *Central Park Bushland Management Plan 2014 - 2019* are to:

- establish a baseline description of the environment to guide future environmental planning and recommended management actions
- outline key environmental threats and management strategies to minimise impact and protect conservation and recreation values
- outline management actions to address key threats including monitoring and reporting.

The objective of the *Central Park Bushland Management Plan 2014 – 2019* is to provide a framework protect and enhance biodiversity values of the natural area whilst maintaining appropriate community access and awareness of the natural area

1.6 Strategic Context

To ensure the *Central Park Bushland Management Plan 2014 – 2019* complements other management initiatives, relevant legislation, policies, guidelines and documents were reviewed and are summarised below.

1.6.1 Local Government

Strategic Community Plan

The City of Joondalup *Strategic Community Plan 2012-2022* highlights the focus on preservation, conservation and accessibility of the City's natural assets and the importance of engaging with the community and regional stakeholders.

Environment Plan

The *City of Joondalup Draft Environment Plan 2013-2018* provides strategic direction in the delivery of environmental initiatives within the City of Joondalup.

Biodiversity Action Plan

The *City of Joondalup Biodiversity Action Plan 2009 – 2019* provides direction for the City's biodiversity management activities and details the development of individual Natural Area Management Plans as an action. The City of Joondalup Strategic Environmental Framework is outlined in Figure 3.

Figure 3: City of Joondalup Strategic Environmental Framework

Local Biodiversity Program (formerly Perth Biodiversity Project)

The City of Joondalup is one of 32 local governments participating in the Western Australian Local Government Association's (WALGA's) Local Biodiversity Program. The aim of the Local Biodiversity Program is to support local governments to effectively integrate biodiversity conservation into land use planning to protect and manage local natural areas.

As part of the Local Biodiversity Program, the City of Joondalup assessed all natural areas from 2004 onwards using the ecological criteria of the Natural Area Initial Assessment, resulting in a priority ranking of natural areas. The City of Joondalup assesses major conservation, high priority and medium priority natural areas approximately every 5 – 7 years using this assessment tool.

Natural Area Initial Assessments include a desktop assessment and field survey and document information such as:

- vegetation complexes
- threatened or significant flora or ecological communities
- structural plant communities
- weed species
- vegetation condition assessment
- ecological criteria ranking;
- a viability estimate
- fauna species observed.

City of Joondalup District Planning Scheme No. 2 Schedule 5

Planning for land use occurs under the District Planning Scheme No. 2. Schedule 5 (Clause 5.3.1) of the District Planning Scheme lists *Places and Objects Having Significance for the Purpose of Protection of the Landscape or Environment*.
Central Park is listed as a place having significance for the purpose of protection of the landscape or environment in Schedule 5 of the District Planning Scheme No 2.

Pest Plant Local Law 2012
The purpose of the *Pest Plant Local Law 2012* is to prescribe pest plants within the City of Joondalup that are likely to adversely affect the value of property in the district or the health, comfort or convenience of the inhabitants of the district.

Pest plants are generally highly adaptable and will establish quickly after a disturbance event such as fire, or through unrestricted access. If pest plants are allowed to establish they have the potential to out-compete the City's unique floral biodiversity. The *Pest Plant Local Law 2012* requires the owner or occupier of private land within the City of Joondalup district to destroy, eradicate or otherwise control scheduled pest plants on notice by the City. Currently one weed species is scheduled under the Local Law – Caltrop (*Tribulus terrestris*). Caltrop has not been identified in Central Park.

1.6.2 State Government

Relevant Legislation, Policies and Documents

Aboriginal Heritage Act 1972
The Act makes provision for the preservation on behalf of the community of places and objects customarily used by or traditional to the original inhabitants of Australia or their descendants. Central Park is not listed on any State or Federal Indigenous heritage inventory or register.

Agriculture and Related Resources Protection Act 1976
The Act gives provision to declare plants and animals that are known to be a significant environmental threat and provides for the management, control and prevention of these declared plants and animals for the protection of agriculture and related resources. One declared plants has been recorded in Central Park, which is One-leaf Cape Tulip (*Moraea flaccida*).

Bushfires Act 1954
The Act makes provision for diminishing the dangers resulting from bush fires and for the prevention, control and extinguishment of bush fires.

Cat Act 2011
The Act makes provision for the control and management of cats and promotes and encourages the responsible ownership of cats.

Environmental Protection Act 1986
The Act provides authority to the Environmental Protection Authority (EPA) for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment in Western Australia.

Heritage of Western Australia Act 1990

The Act provides for and encourages the conservation of places which have significance to the cultural heritage in the State. Central Park is not listed on any State or Federal cultural heritage inventory or register.

Wildlife Conservation Act 1950

The Act provides the statute relating to conservation and legal protection of flora and fauna

Six fauna species listed under the Wildlife Conservation Act 1950 are considered to either use or possibly use Central Park, these being:

- Baudin's Cockatoo (*Calyptorhynchus baudinii*) (bird) – (**Threatened)**
- Black-striped Snake (*Neelaps calonotos*) (reptile) – (**Specially protected fauna)**
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) (bird) – (**Threatened)**
- Carpet Python *(Morelia spilota subsp. imbricata)* (reptile) – (**Threatened)**
- Peregrine Falcon (*Falco peregrinus*) (bird)- (**Specially protected fauna)**
- Shield-backed Trapdoor Spider (*Idiosoma nigrum*) (invertebrate) – (**Threatened)**

WA Planning Commission "Bush Forever" Strategy 2000

The Strategy identifies regionally significant bushland in the Perth Metropolitan Region to be retained, managed and protected forever. Central Park is not listed as a Bush Forever site but contains three flora species considered to be naturally occurring significant flora of the Perth Metropolitan Region, these being:

- *Hibbertia cuneiformis*
- *Jacksonia sericea* –(**Priority 4)**
- *Lechenaultia linarioides*

State Planning Policy 2.8 – Bushland Policy for the Perth Metropolitan Region

The *State Planning Policy 2.8 – Bushland Policy for the Perth Metropolitan Region* aims to provide direction and an implementation framework that will ensure bushland protection and management issues in the Perth Metropolitan Region are appropriately addressed and integrated with broader land use planning and decision-making.

Environmental Weed Strategy for Western Australia 1999

The Department of Environment and Conservation (DEC) developed an Environmental Weed Strategy for Western Australia (WA) (1999). The Strategy prioritises 1,350 weed species using the criteria of invasiveness, distribution and environmental impacts to rate weeds as high, moderate, mild or low priority. High ratings were issued to 34 weed species. Central Park contains seven high priority rated weeds in the Environmental Weed Strategy for WA

1.6.3 Federal Government

Environment Protection and Biodiversity Act 1999

The Act provides for the protection of the environment and the conservation of biodiversity, and for related purposes. Five *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* listed species have been recorded in or as potentially occurring within Central Park:

- Carnaby's Black Cockatoo, (*Calyptorhynchus latirostris*) - **Endangered**
- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) - **Threatened**
- Fork-tailed Swift (*Apus pacificus*) - **Migratory**
- Graceful Sun Moth (*Synemon gratiosa*) - **Endangered**
- Rainbow Bee-eater (*Merops ornatus*) - **Migratory**

Australia's Biodiversity Conservation Strategy 2010-2030

The Strategy aims to protect biological diversity and maintain ecological processes and systems.

National Weeds Strategy 1997

The National Weeds Strategy provides a strategic framework for managing weeds at a national level. As part of the implementation of the National Weeds Strategy, 32 Weeds of National Significance are identified as nationally agreed priority plant species for control and management based on the criteria of invasiveness and impact characteristics, potential and current area of spread and economic, environmental and social impacts. Central Park contains no known Weeds of National Significance.

1.6.4 International Conventions or Listings

International Union for Conservation of Nature (IUCN) Red List of Threatened Species

The IUCN Red List of Threatened Species™ provides taxonomic, conservation status and distribution information on plants and animals that have been globally evaluated using the IUCN Red List Categories and Criteria. One endangered IUCN Red List species have been recorded for Central Park, Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*).

1.6.5 Stakeholder Consultation

The City has consulted with the West Cost Institute of Training during the development of this plan.

1.6.6 Land Tenure and Vesting

Central Park is crown land managed by the City of Joondalup.

2.0 Description of the Environment

2.1 Geology, Soils and Landforms

2.1.1 Soils of the Swan Coastal Plain

Central Park is situated within the City of Joondalup, which is located within the Swan Coastal Plain. It is characterised by Tuart and heath on limestone soils, and Banksia-Jarrah-Marri woodland on sandy soils. The majority of the soils of the Swan Coastal Plain are formed by material deposited by rivers and wind. A series of dune systems has been formed with the youngest dunes being the Quindalup Dunes nearest the coast, followed by the Spearwood Dunes and the oldest Bassendean Dunes are farthest from the coast (Figure 4).

Central Park is located within the Spearwood Dunes which have a core of sandy aeolianite with a capping of secondary limestone (Tamala Limestone, predominantly calcarenite) overlain by yellow brown siliceous sands with weak podzol development.[12] The Spearwood Dunes are believed to have formed around 40,000 years ago and comprise of red/brown, yellow and pale yellow/grey sands.[3] The Spearwood Sand Phase is characterised by undulating dunes with rocky crests on aeolian sand over limestone.

Two major soil types occur at the Site[4]; the Karrakatta sand yellow phase and the Karrakatta shallow soils phase (Figure 5). The shallow Karrakatta soil type is located in the northern section of the site and is characterised by numerous limestone outcrops. A description of each soil type is presented in Table 1.

Table 1: Soil Types – Central Park[5]

Map Unit	Name	Description
211Sp__Ky	Karrakatta Sand Yellow Phase	Undulating dunes on aeolian sand over limestone in the Swan Coastal Plain between Wanneroo and Lancelin, yellow deep sands, Jarrah-Marri-Tuart-Banksia woodland with dense shrubs.
211Sp__Kls	Karrakatta shallow soils Phase	Rocky low hills and ridges on limestone in the Swan Coastal Plain between Wanneroo and Lancelin, bare rock, yellow-brown shallow sands and stony soils, dense Parrot Bush-Hakea scrub.

The land contours of Central Park range from 48 to 56 metres Australian Height Datum (AHD).

[1] Department of Environment (2004)
[2] McArthur and Bettenay, (1974)
[3] Bolland (1998)
[4] Department of Agriculture and Food (2012b)
[5] Department of Agriculture and Food, (2012b)

Figure 4: Soils of the Swan Coastal Plain (Department of Agriculture, 2002)

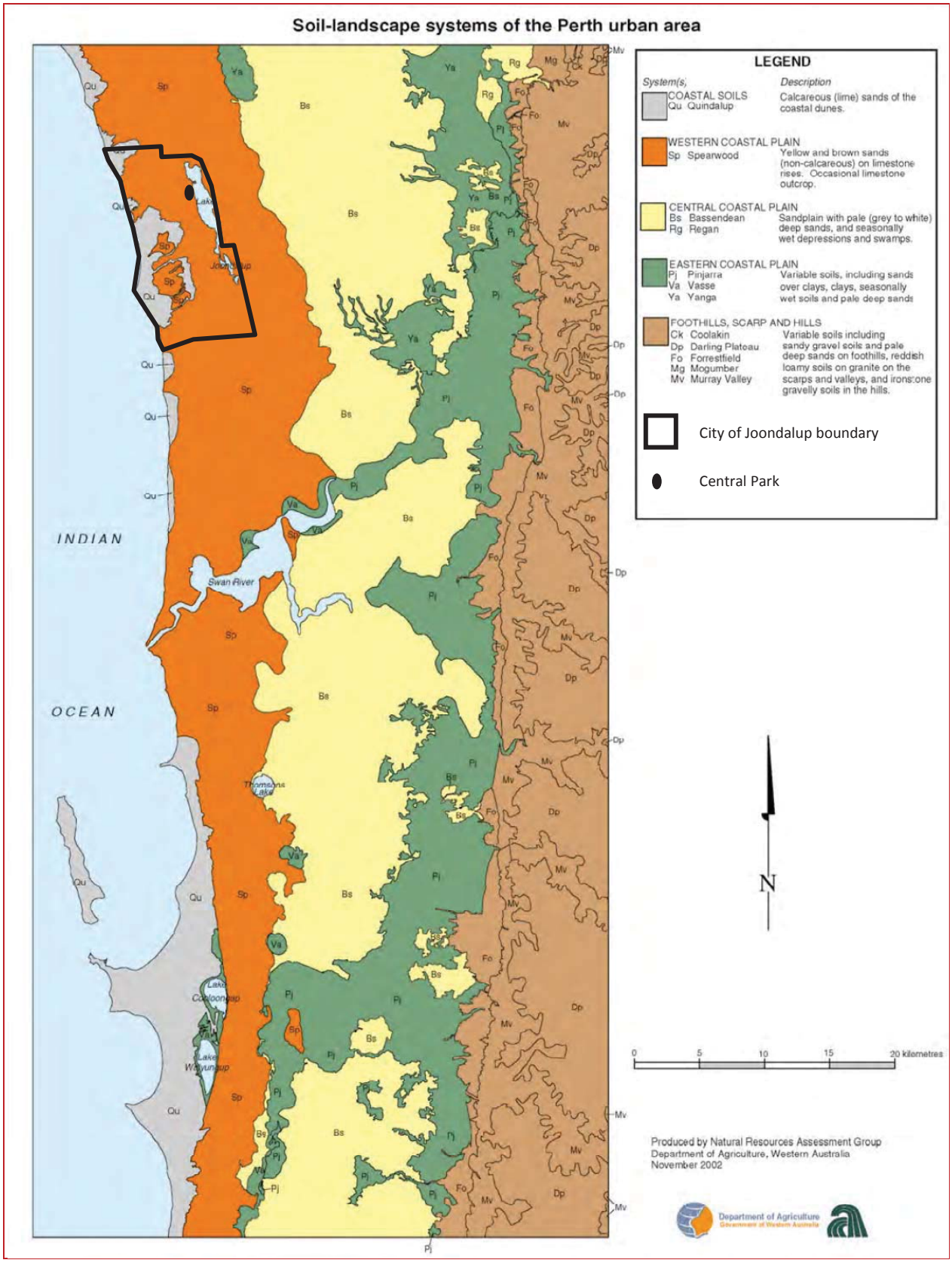
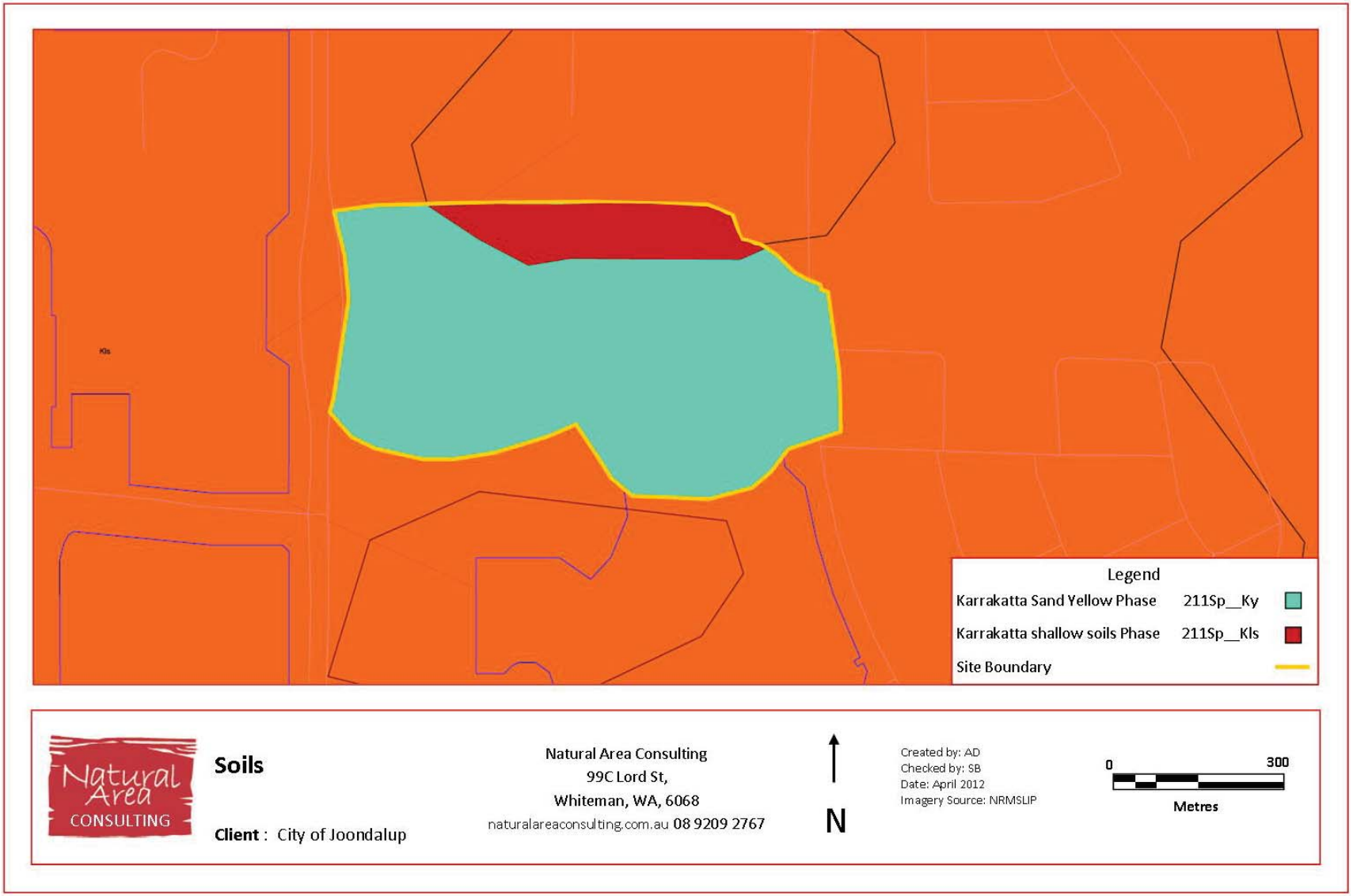


Figure 5: Soils in Central Park



2.1.2 Acid Sulphate Soils

Acid sulphate soils are naturally occurring soils and sediments that contain iron sulphides. They are predominantly found in low-lying coastal wetlands and tidal flats and are harmless when left undisturbed. Exposure to air causes the iron sulphides in acid sulphate soils to react with oxygen and water producing iron compounds and sulphuric acid, which can lead to heavy metals being released into the surrounding environment.[6]

Acid sulphate soils are categorised as potential acid sulphate soils (PASS) or actual acid sulphate soils (AASS). Potential acid sulphate soils have not been oxidised by exposure to air whilst actual acid sulphate soils have been disturbed or exposed to oxygen and become acidic.[7] The risk of acid sulphate soils is based on their likelihood of occurring within soil profiles and has been mapped by the Department of Parks and Wildlife (DPaW) using available desk-top information and limited ground-truthing within areas where intensive on-ground mapping and soil analysis work has been undertaken. The mapping undertaken has found that acid sulphate soils are not known or expected to occur in the environment of Central Park on the basis of origin of the geological units present, depth to groundwater and partial 'ground truthing' or onsite investigation.

2.2 Hydrology

2.2.1 Groundwater

The City of Joondalup is located on Perth's largest source of groundwater, the Gnangara Groundwater System, comprising four main aquifers: superficial (shallow, unconfined), Mirrabooka (deeper, semi-confined), Leederville (deep, mostly confined) and the Yarragadee (deep, mostly confined). The Gnangara Mound extends across most of the superficial aquifer and refers to the water table creating a mound shape (Figure 6). Groundwater levels in the superficial aquifer have been declining over recent years due to pressure from extraction and the impacts of climate change.

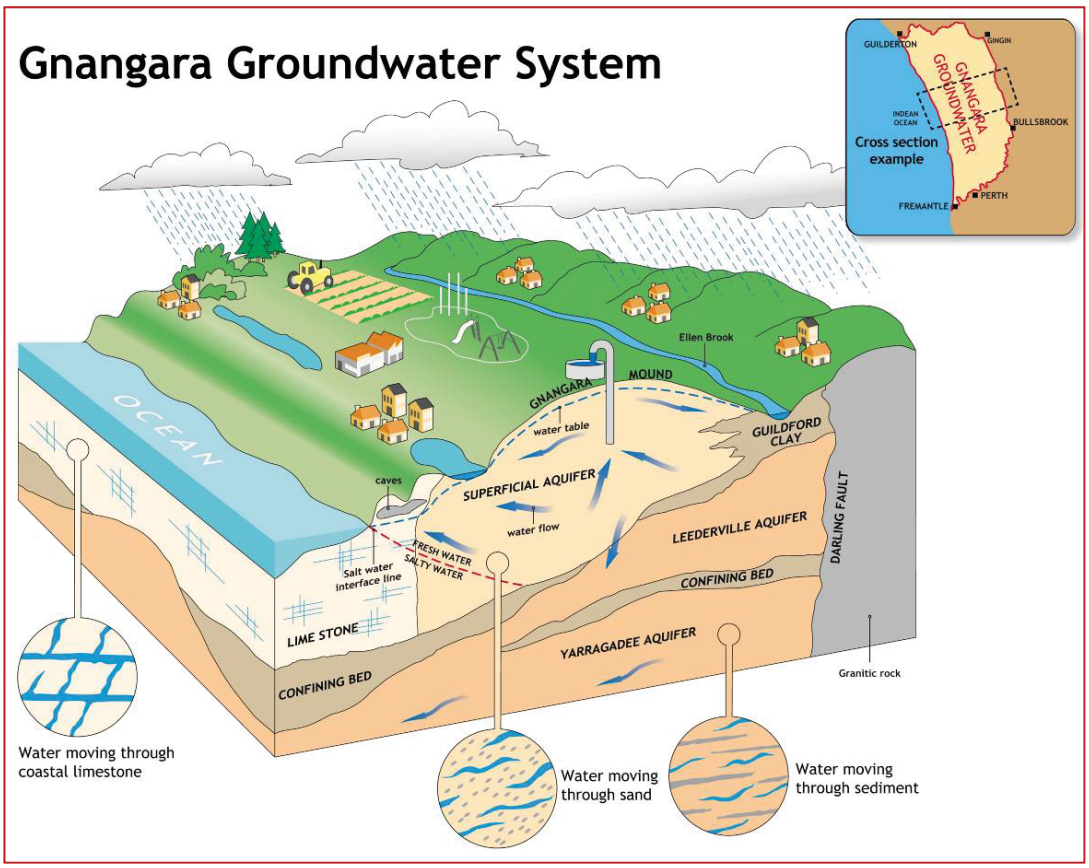
Depth to ground water in Central Park is between 41 – 48 metres AHD while the depth to the base of the superficial aquifer formation is between 18 – 26 metres AHD.[8] This is consistent with a site located on a dune crest (Figure 7).

2.2.2 Drainage

The study area has one drainage pipe within its boundaries. This is located in the north-east corner of the site (Figure8)

[6] Department of Environment (2004)
[7] Department of Environment and Conservation, n.d.
[8] Department of Environment (2004)

Figure 6: Gnangara Groundwater System[9]



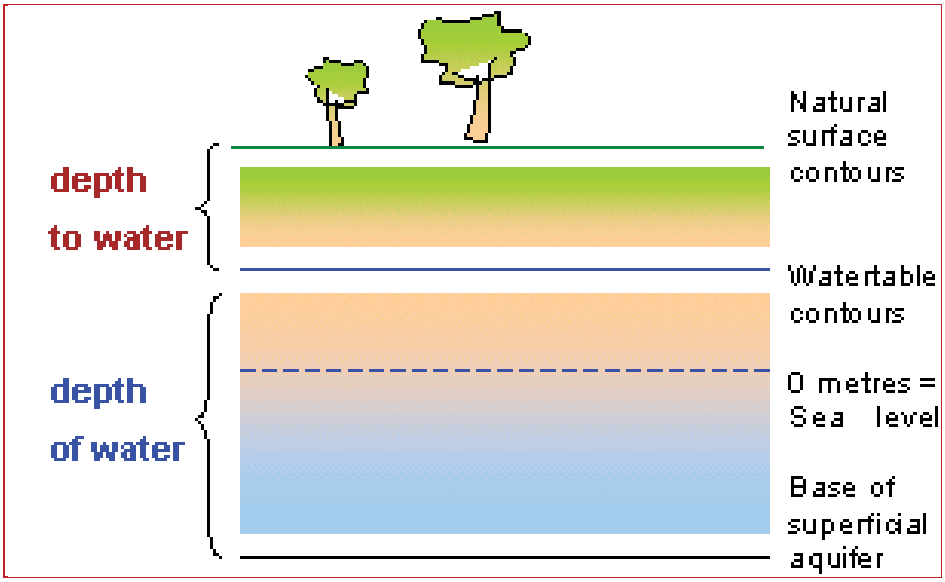


Figure 7: Groundwater Depth Explanation[10]

[9] Department of Water, n.d.
[10] Department of Environment, 2004

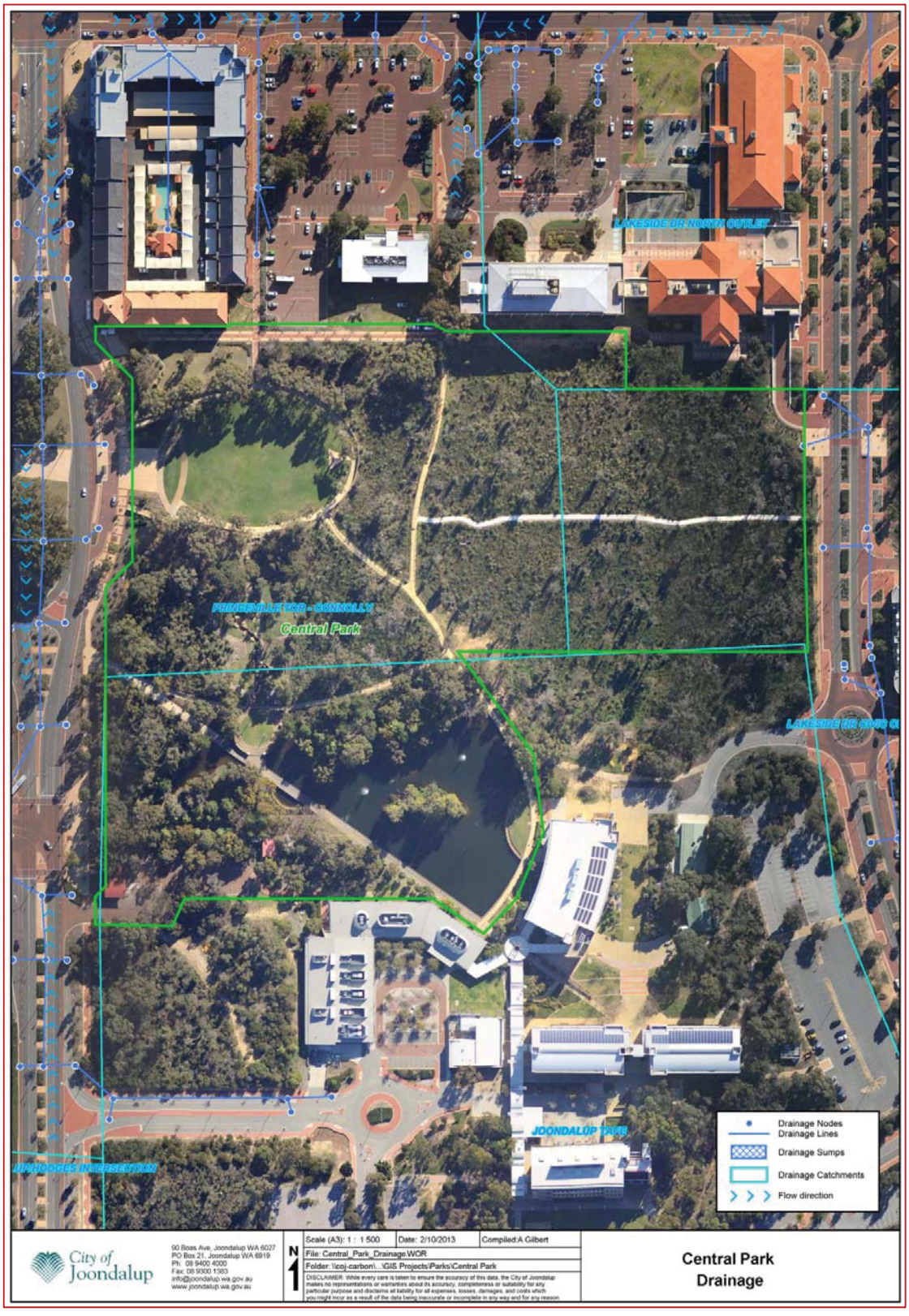
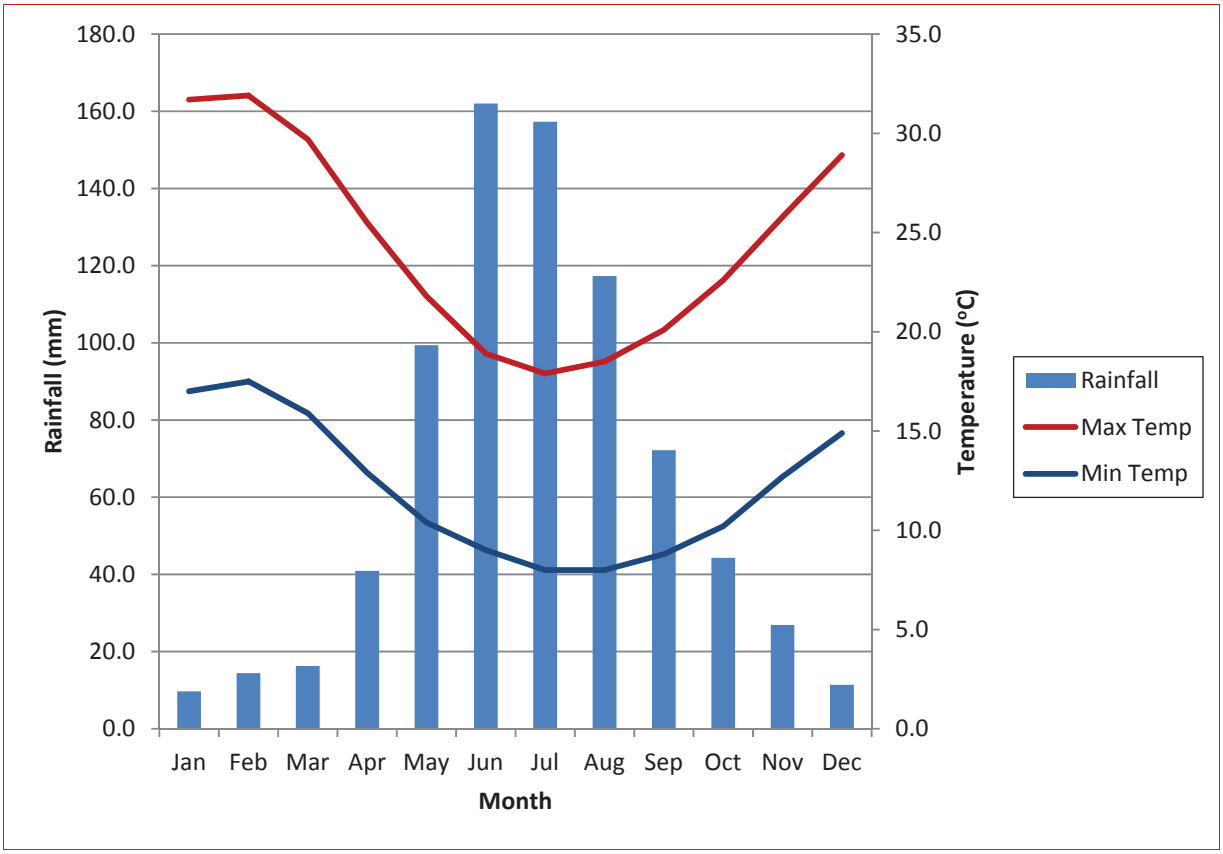


Figure 8: Stormwater drainage reticulation Central Park

2.3 Climate

The City of Joondalup experiences a Mediterranean climate of hot dry summers with an average temperature of 31 degrees during the day and mild wet winters with an average day time temperature of 18 degrees. The average annual rainfall from 2002 to 2012 was 679mm. Approximately 80 percent of the annual rain falls between the months of May and September (Figure 9).

Figure 9: Climate data for Perth[11]



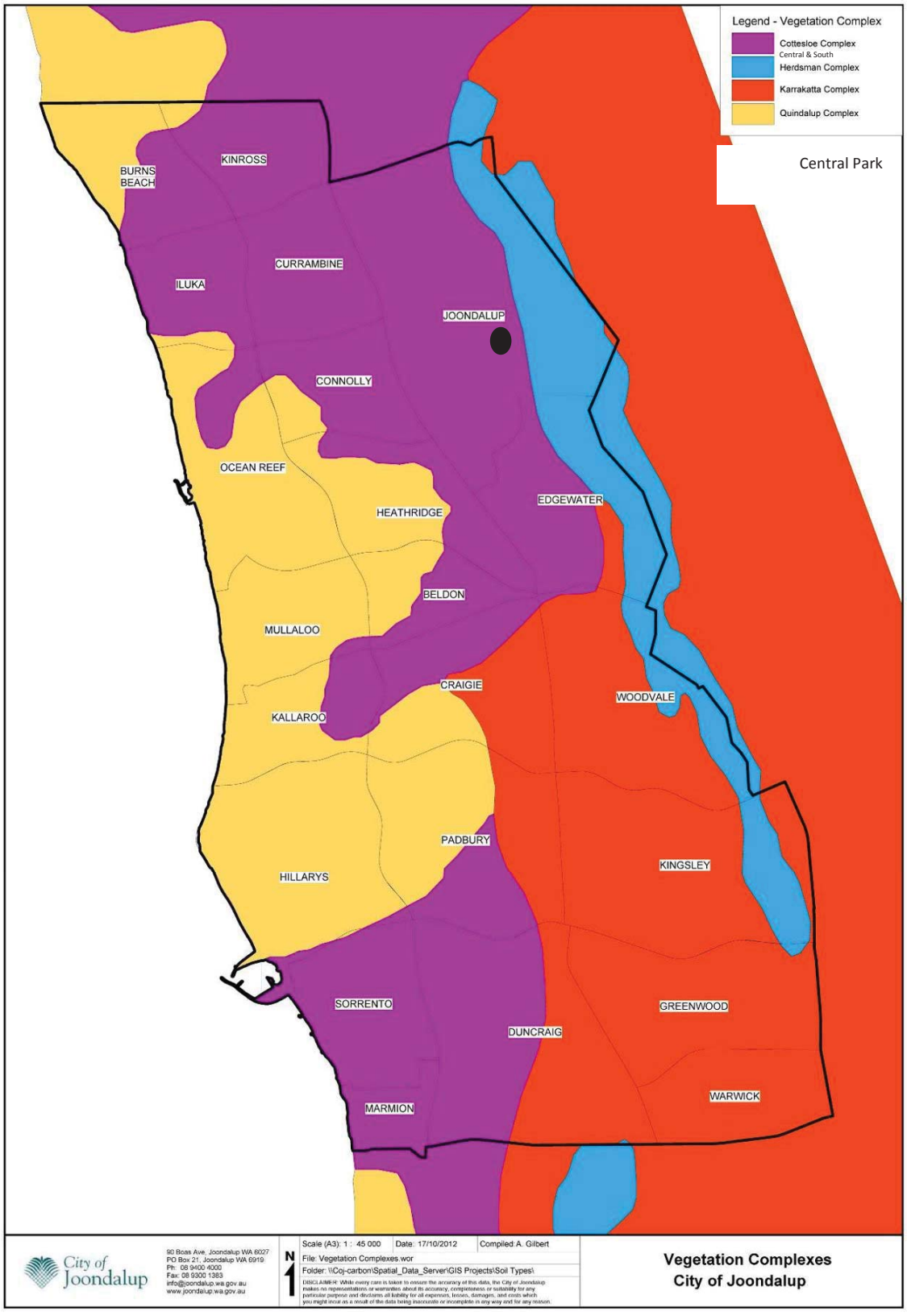
2.4 Vegetation

2.4.1 Vegetation Complexes

Vegetation complexes are classified by the soil and landforms contained in medium to large areas along the Swan Coastal Plain. Regional scale mapping shows the study area is classified as having Cottesloe Complex – Central and South (Figure 10). This complex consists of a mosaic of Tuart woodland and an open forest of Tuart-Jarrah-Marri on the deeper sands, with heaths on limestone outcrops[12] .

[11] Bureau of Meteorology (2012)
[12] Heddle *et al* (1980)

Figure 10: City of Joondalup Vegetation Complexes



The City of Joondalup portion of the pre-European extent of Cottesloe Complex – Central and South in Perth and Peel was 9% (3,966 ha). Approximately 35% (15,251 ha) of this vegetation complex currently remains in Perth and Peel, with the City of Joondalup proportion of the current extent being 2% (345 ha) and the level of retention is just under 9%. See Figure 10.

2.4.2 Floristic Community Types

Floristic Community Types (FCTs) are generally groups of flora species that consistently occur together. Central Park is inferred to have the following FCTs:

- FCT 26b – Woodlands and mallees on Limestone
- FCT 28 - Spearwood *Banksia attenuata* or *Banksia attenuata* - *Eucalyptus* woodlands.

Whilst FCTs can be a useful way of describing groups of flora species, vegetation communities are more commonly used to define plant communities.

2.4.3 Vegetation Communities

Four vegetation communities were identified in Central Park, as described in Table 2 and Figure 11. Vegetation structural classes are provided in Appendix 2. No Threatened or Priority Ecological Communities were identified within Central Park or in nearby bushland.

Table 2: Vegetation communities in Central Park

Vegetation Community	Description	Site Coverage	Photograph
Open Tuart woodland	Open woodland of *Eucalyptus gomphocephala* (Tuart) over a low woodland of mixed *Banksia* species (*B. attenuata, B. grandis, B. menziesii, B. prionotes*). Below this is a *Xanthorrhoea preissii* shrubland with *Acacia pulchella* and *Hakea prostrata* and a low shrubland of *Hakea lissocarpha, Hibbertia hypericoides* and *Petrophile macrostachya*. Pockets of very open sedgeland of *Mesomelaena pseudostygia* with scattered occurrences of *Lepidosperma squamatum* and *Dianella revoluta* var. *Divaricata* occur throughout the woodland.	22.7%	
Limestone heath	Open woodland of *Eucalyptus gomphocephala* (Tuart) over a low open woodland of Banksia species (*B. attenuata, B grandis*). Before the fire tall *Banksia sessilis* shrubland occurred in patches; Under these is an open shrubland of *Calothamnus quadrifidus, Grevillea preissii, Hakea lissocarpha, Leucopogon parviflorus* and *Xanthorrhoea preissii* with an open low heath of Acacia *pulchella, Lechenaultia linarioides, Jacksonia sericea, J. Calcicola* and *Scaevola canescens*. Very open grassland of *Austrostipa flavescens* mixed with a very open sedgeland component that has either *Mesomelaena pseudostygia* or various *Lomandra* species present. A very open herbland with *Conostylis candicans* and *Haemodorum laxum* is also present. The soil is typically brown-yellow sands with outcrops of limestone visible at the surface.	34.3%	

Vegetation Community	Description	Site Coverage	Photograph
Jarrah woodland	A woodland of *Eucalyptus marginata* (Jarrah) with *Banksia attenuata* and *Allocasuarina fraseriana* over a shrubland of *Macrozamia fraseri, Xanthorrhoea preissii, Hibbertia hypericoides, Hakea lissocarpha* and *Acacia pulchella*. A very open grassland of *Austrostipa flavescens* is present as is an open Herbland with *Haemodorum laxum* and the introduced species *Moraea flaccida* (One-leaf Cape Tulip).	20.7%	
Open Marri forest	Open forest of *Corymbia calophylla* (Marri) with *Eucalyptus marginata* and *Allocasuarina fraseriana* over a low open woodland of *Banksia attenuata* and a shrubland of *Xanthorrhoea preissii, Acacia pulchella, Gompholobium tomentosum* and *Hardenbergia comptoniana*. A very open sedgeland of *Dichopogon capillipes* and *Desmocladus flexuosa* compete with open grassland of *Ehrharta longiflora* (Annual Veldt Grass) and an open herbland of *Gladiolus caryophyllaceus* (Pink Gladiolus) and *Carpobrotus edulis* (Pigface).	22.2%	

Figure 11: Vegetation Communities in Central Park

2.4.4 Vegetation Condition

Vegetation condition assessments include observations regarding the numbers of native species, weed cover, vegetation structure, species diversity, amount of understorey, health condition of most species' populations and physical disturbance. The Keighery Scale is a tool used to rate the condition of vegetation from pristine to completely degraded, as detailed in Appendix 3. The City of Joondalup conducted Natural Areas Initial Assessments in 2004 and 2009 to assess the vegetation condition at the site. Natural Area Consulting conducted a vegetation condition assessment in 2012.

The vegetation condition at Central Park ranges from Very Good to Completely Degraded. The majority of the remnant vegetation is in Good condition, with the Very Good condition bushland being in the south-west corner of the site. The Degraded patches are largely near the edges of the bushland where there is infrastructure and paths. Vegetation condition in Central Park is shown in Table 3 and Figure 12.

Since 2009 there has been a reduction in the amount of vegetation rated as Excellent and Very Good with an increase in the amount of vegetation rated as Good. This can be largely attributed to the recent bush fires that have occurred over much of Central Park during the summer of 2011 – 2012.

Table 3: Vegetation condition assessment using the Keighery Scale

Year	Pristine	Excellent	Very Good	Good	Degraded	Completely Degraded
2004	0	20%	45%	25%	10%	0
2009	0	20%	50%	55%	10%	5%
2012	0	0	7%	76%	16%	1%

Figure 12: Vegetation Condition in Central Park

3.0 Biodiversity Conservation

Central Park supports a variety of plant and animal species, including some species considered significant to the Perth metropolitan area. The long term protection of biodiversity values within Central Park is critical to ensure the conservation of this unique habitat. The protection and enhancement of biodiversity within Central Park also benefits the community through the provision of ecological services such as:

- the production of oxygen and capture of carbon dioxide
- noise and air quality regulation
- cooling of urban environments
- supporting seed dispersal and pollination
- a number of recreational and cultural experiences[13].

There are a number of environmental threats that pose a risk to the biodiversity of Central Park. The key environmental threats include:

- weeds
- pathogens and disease
- non-native fauna species
- human impacts
- access and infrastructure
- fire.

Management strategies to address the key environmental threats have been established and are discussed in the following sections.

3.1 Flora

Central Park is located within the Southwest Australia biodiversity hotspot. Southwest Australia, from Shark Bay in the north to Israelite Bay in the south, is one of 34 biodiversity hotspots in the world with over 2,900 endemic plant species occurring in this region. Approximately 30% of the original vegetation extent of this area remains, with habitat loss being primarily due to agricultural expansion.[14]

Flora surveys enable collection of scientific data related to the occurrence and distribution of flora species and vegetation communities. Information obtained from flora surveys is used as a baseline to monitor the ecological health of flora populations and vegetation communities. Natural Area Consulting was engaged to undertake a desktop and field flora survey of Central Park in March 2012.

[13] City of Joondalup (2012b)
[14] Conservation International (2013)

3.1.1 Flora Survey Methodology

Desktop Study

A review was undertaken of all the available information provided by the City of Joondalup and any additional relevant information to provide a detailed background for Central Park. Natural Area Initial Assessments were undertaken by the City of Joondalup in 2004 and 2009 and were reviewed as part of the desktop study. Natural Area Initial Assessments include documenting information such as:

- vegetation complexes
- threatened or significant flora or ecological communities
- structured plant communities
- weed species
- rating vegetation condition
- ecological criteria rankings
- a viability estimate.

External databases were also consulted, including:

- NatureMap, for local species previously recorded in the surrounding area
- DEC threatened and priority flora databases
- DEC threatened and ecological community database
- Protected Matters Search Tool provided by Department of Sustainability, Environment, Water, Population and Communities for significant fauna, flora, threatened and priority ecological communities at a Commonwealth level.

Field Survey

The design of the flora survey was aligned with methodology outlined in EPA *Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*. The methodology undertaken in conducting the survey included the use of 10 m x 10 m quadrats and opportunistic sampling of species not recorded within the quadrats. A minimum of two quadrats were established per vegetation community. The quadrat matrix is provided in Appendix 6.

It should be noted the species list was compiled from the outcomes of the survey undertaken during the warmer months of March and April and some native geophytic species, such as members of the Orchidaceae family (orchids),the genera Thysanotus (Fringed Lilies), Drosera (Sundews), herbaceous species such as Stylidium (trigger plants) and other small herbaceous annuals are under-represented. This applies similarly to geophytic species of weeds, such as the One-leaf Cape Tulip (*Moraea flaccida*) and Pink Gladiolus (*Gladiolus caryophyllaceus*), along with annual weeds such as grasses.

3.1.2 Native Flora

Native flora is an important part of the Central Park Reserve ecosystem. The loss of native plant species can lead to a loss of fauna that depend on flora for food and shelter. A total of 138 flora species were recorded on site, including 102 (74%) native species and 36 (26%) introduced species. A list of species

identified is presented in Appendix 4, and has been used to compile the revegetation list for the area. The quadrat data and locations used to sample the vegetation are presented in Appendix 5.

One plant species, *Conostylis candicans,* is native to the area but is considered to be introduced to the reserve through planting activities.[15] There were three species of significant flora found within Central Park (Table 4). One was a species of Priority flora, *Jacksonia sericea*. This has a Priority 4 rating as it is considered to be endemic to the Perth Metropolitan Area. A description of the Conservation Codes of Western Australia is given in Appendix 1. This was the only flora species to be highlighted in the desktop reviews.

The other significant flora species found in Central Park are *Lechenaultia linarioides* and *Hibbertia cuneiformis*. *Lechenaultia linarioides* is thought to be poorly represented in reserves within the metropolitan region and *Hibbertia cuneiformis* is near the northern limit of its range. Significant flora are species listed in Bush Forever[16] as being of particular interest as they are either rare, poorly known, restricted in distribution or have some other distinctive feature.

Petrophile serruriae was previously listed as a species of significant flora. This has been renamed *P. axillaris* and it is no longer considered to be under threat in the region. However, it is rare within the park boundaries, with only two plants seen growing in the south western pocket. Figure 13 illustrates the location of the significant flora in Central Park.

[15] City of Joondalup, personal communication
[16] Government of Western Australia (2000)

Table 4: Significant flora in Central Park

Name	Common Name	Conservation Status	Photograph
Hibbertia cuneiformis	Cutleaf Hibbertia	Northern extent of natural range, Significant Flora of the Perth Metropolitan Region	
Jacksonia sericea	Waldjumi	Priority 4 Taxa endemic to the Swan Coastal Plain, Significant Flora of the Perth Metropolitan Region	
Lechenaultia linarioides	Yellow Leschenaultia	Considered to be poorly reserved, Significant Flora of the Perth Metropolitan Region	

Figure 13: Distribution of Significant flora in Central Park

3.1.3 Weeds

Non-native flora or weeds can be exotic species or native species in ecosystems in which they previously did not exist. Weeds are commonly introduced and distributed within bushland areas through the dispersal of seed by water, wind, animals such as birds, fire, the dumping of garden refuse, human or vehicle movement in natural areas.

Weeds have major economic, environmental and social impacts in Australia and can:

- displace native plant species
- alter nutrient recycling and soil quality
- harbour pests and diseases
- create fuel loads for fires
- impact negatively on fauna and flora and their habitats
- compete with native species for space, water and nutrients[17].

Over 28,000 known alien plant species have been introduced to Australia with approximately 10% now being established in the environment.[18] Garden plants are the main source of Australia's weeds, accounting for 66% of recognised weed species.[19]

A total of 36 weed species have been recorded at Central Park (Appendix 4). The majority of the weed species were grasses from the Poaceae family, geophytes from the Iridaceae family and daisies from the Asteraceae family. The most common weed species found in Central Park were Perennial Veldt Grass (*Ehrharta calycina*), One-leaf Cape Tulip (*Moraea flaccida*), Pigface (*Carpobrotus edulis*), Rose Pelargonium (*Pelargonium capitatum*), Wild Turnip (*Brassica* sp.) and Geraldton Carnation Weed (*Euphorbia terracina*). There is also a high incidence of Nightshade (*Solanum nigrum*) that has likely been stimulated by the recent fire events within the park.

No Weeds of National Significance were recorded in Central Park; however one declared plant, One-leaf Cape Tulip (*Moraea flaccida*), has been recorded. Seven weed species recorded in Central Park were rated as having a high treatment priority in the Environmental Weed Strategy for WA (1999). Key weed species existing in Central Park are shown in Table 5 and the location of significant weed species is shown in Appendix 7.

[17] DSEWPC (2013)
[18] Groves, Boden and Lonsdale (2005)
[19] DSEWPC (2013)

Table 5: Priority weed species in Central Park

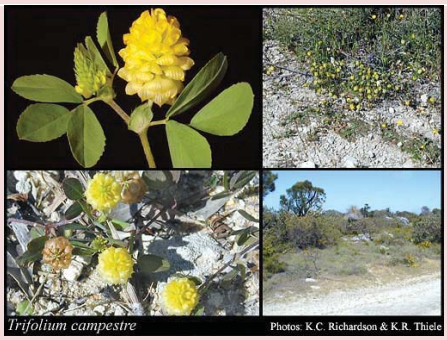
Name	Common Name	Conservation Status	Photograph
Avena barbata	Wild oats	Moderate priority (DEC Environmental Weed Strategy for WA)	
Brassica tournefortii	Wild turnip	High priority (DEC Environmental Weed Strategy for WA)	
Briza maxima	Blowfly grass	Moderate priority (DEC Environmental Weed Strategy for WA)	 Photos: A. Ireland & K.R. Theile (WA Herbarium n.d.)
Carpobrotus edulis	Pigface	Moderate priority (DEC Environmental Weed Strategy for WA)	

Name	Common Name	Conservation Status	Photograph
Cirsium vulgare	Spear thistle	Moderate priority (DEC Environmental Weed Strategy for WA)	
Conyza bonariensis	Fleabane	Low priority (DEC Environmental Weed Strategy for WA)	
Dittrichia graveolens	Stinkwort	Mild priority (DEC Environmental Weed Strategy for WA)	
Ehrharta calycina	Perennial Veldt	High priority (DEC Environmental Weed Strategy for WA)	

Name	Common Name	Conservation Status	Photograph
Ehrharta Longiflora	Annual Veldt	Low priority (DEC Environmental Weed Strategy for WA)	
Euphorbia terracina	Geraldton Carnation Weed	High priority (DEC Environmental Weed Strategy for WA)	
Gladiolus caryophyllaceus	Pink gladiolus	Moderate priority (DEC Environmental Weed Strategy for WA)	
Lactuca serriola	Prickly lettuce	Moderate priority (DEC Environmental Weed Strategy for WA)	

Name	Common Name	Conservation Status	Photograph
Lagurus ovatus	Hare's tail grass	High priority (DEC Environmental Weed Strategy for WA)	
Moraea flaccida	One-leaf Cape Tulip	**Declared Weed (DAFWA)** High priority (DEC Environmental Weed Strategy for WA)	
Pelargonium capitatum	Rose pelargonium	High priority (DEC Environmental Weed Strategy for WA)	
Pennisetum clandestinum	Kikuyu	Moderate priority (NAC recommendation) EWSWA rating Unavailable	

Name	Common Name	Conservation Status	Photograph
Phytolacca octandra	Inkweed	Mild priority (DEC Environmental Weed Strategy for WA)	
Ricinus communis	Castor oil	Low priority (DEC Environmental Weed Strategy for WA)	
Romulea rosea	Guildford grass	High priority (DEC Environmental Weed Strategy for WA)	
Solanum nigrum	Nightshade	Moderate priority (DEC Environmental Weed Strategy for WA)	

Name	Common Name	Conservation Status	Photograph
Sonchus asper	Sowthistle	Moderate priority (DEC Environmental Weed Strategy for WA)	
Trifolium campestre	Hop clover	Moderate priority (DEC Environmental Weed Strategy for WA)	 Photos: K.C. Richardson & K.R. Theile (WA Herbarium n.d.)

One-leaf Cape Tulip (*Moraea flaccida*)

The One-leaf Cape Tulip (*Moraea flaccida*) is a declared plant in Western Australia,[20] it is found at high densities throughout the site (Appendix 7). The treatment of this invasive species has been flagged as a high priority by the City of Joondalup. The Cape Tulip can significantly damage the ecology of bushland areas by smothering native vegetation as well as being toxic to many animal species. This plant is a geophyte in that it is spring active, sending out shoots from an underground corm (bulb) and flowering after winter. Following this period of activity the plant sets seed and dies off. The Cape Tulip can produce copious amounts of seed. The prolific seed production means that treatment can be difficult and manual removal can serve to spread the infestation through the dispersal of seeds (if not undertaken before seed set). In areas of bushland with heavy infestations of geophytes, mechanical removal can severely degrade soil structure, beneficial soil flora and the roots systems of native plant species. In these circumstances the use of herbicides is the preferred method of control.

[20] Department of Agriculture (2012a)

Figure 14: **One-leaf_**Cape Tulip (*Moraea flaccida*)

The treatment preferred by the City is to hand wipe the leaves with Metsulfuron prior to or just on flowering.

3.1.4 Revegetation

The City of Joondalup encourages natural bushland regeneration through weed management and conservation fencing to allow the vegetation to re-establish itself and maintain species diversity and populations. Revegetation is conducted on degraded or completely degraded areas using local provenance species, as required.

3.1.5 Current Management Approach

The City undertakes an integrated approach to weed management, including:

- prevention of introduction of weeds through weed hygiene measures
- regular monitoring and reporting of weed populations
- on ground weed control, including prioritisation of natural areas and priority weeds to target
- community education initiatives
- fire prevention measures.

Weed monitoring is conducted monthly at Central Park to establish the extent and distribution of weed species and to identify priority weeds. Natural Areas Initial Assessments are conducted approximately every 5 years in Central Park to assess site-specific ecological values, biodiversity significance and threatening processes at a level that is consistent with regional scientific standards. The outcomes from weed monitoring inform on ground weed management programs. The vegetation condition assessment (Figure 12) also informs weed management as the vegetation in the best condition can be prioritised for weed control.

In accordance with the City's Bushland Maintenance Schedules, on ground weed management occurs through weed spraying and hand weeding methods. In addition to this, contractors are engaged to spray

weeds and hand weed. City of Joondalup personnel use a weed spraying procedure and conduct trials periodically to evaluate the most effective management methods. Resources, such as the DPaWs Florabase website or *Southern Weeds and their Control* (DAFWA Bulletin 4744), are also consulted in regards to weed control.

Environmental weeds are classified as priority if they meet any of the following criteria:

- weed of national significance
- declared plant
- high priority weed according to the Environmental Weed Strategy for WA (EWSWA)
- pest plant under Local Government Act 1995
- major threat to vegetation
- major threat to the structure of vegetation communities
- contribute to a high fuel load, for example grasses.

A list of weeds and their priority rating according to EWSWA (CALM, 1999[21]) and the (DEC, 2011[22]) is provided in Appendix 9, with the recommended weed treatment methodology for high priority weed species is detailed in Appendix 8.

A City of Joondalup Weed Management Plan is to be developed in 2013/14 to provide an ongoing strategic approach to the management of natural areas in order to reduce the incidence of weeds.
A number of education initiatives are undertaken to raise the awareness of weeds with the community, these include:

- delivery of gardening workshops
- development and distribution of two weed brochures – *Environmental Weeds* and *Garden Escapees* (available in hard copy and on the City's website)
- weed education workshops for Local Friends Groups.

[21] CALM, 1999
[22] DEC, 2011

3.1.6 Recommended Management Actions

To monitor, conserve and protect native flora in Central Park, the following management actions are proposed:

Action	Detail
Weed Survey	Undertake a follow up weed survey within the next 5 years to supplement the previous flora survey.
Weed Control	Undertake coordinated approach to regular weed control by implementing Bushland Maintenance Schedules.
Targeted control of Cape Tulip species	Make Cape Tulip (*Moraea flaccida*) a locally important priority weed and target it for control in Central Park.
Weed Management Plan	Develop and implement a *City of Joondalup Weed Management Plan* to provide an ongoing strategic approach to the management of natural areas in order to reduce the incidence of weeds.
Revegetation	Conduct revegetation as outlined in the Recommended Revegetation Strategy in Appendix 10**.**
Natural Areas Initial Assessment	Conduct five yearly follow up of Natural Areas Initial Assessment in spring to monitor ecological health of site.

3.2 Fungi

It is estimated that there are 10 times more species of fungi than plants in the world, equating to approximately 140,000 fungi and 14,000 plant species in Western Australia.[23] The amount of species of fungi present in bushland can be an indicator of ecosystem health. Fungi are strongly interconnected with plants and animals as fungi are recyclers that break down litter and debris to provide nutrients for plants.[24] Native plants such as eucalypts, wattles and orchids have beneficial partnerships with fungi. Fungi also provide food and/or habitat for fauna such as bandicoots and beetles.[25]

Fungi surveys are important in providing baseline information and to highlight changes in fungi occurrence over time. Undertaking surveys also enables comparison of ecological data with other City of Joondalup natural areas.

3.2.1 Fungi Survey Methodology

During the flora and fauna survey components, Natural Area Consulting recorded all incidental sightings of fungi within Central Park. Four fungi species were recorded from the study area (Table 6). Due to time limitations, the fungi survey was conducted in late summer where the weather had been warm and dry. The optimum time for fungi surveys is in autumn or winter after substantial rainfall. Those that were observed were restricted for the most part around the parkland areas. It is probable that their presence was due to water from reticulation of the grassland.

3.2.2 Current Management Approach

The City of Joondalup currently notes and records incidental sightings of fungi in Central Park through scheduled bushland maintenance operations.

3.2.3 Recommended Management Actions

To monitor fungi health in Central Park, the following management action is proposed:

Action	Detail
Fungi survey	Undertake a comprehensive fungi survey in autumn or winter after substantial rain, to supplement previous incidental fungi survey, every 5 years.

[23] Bougher, 2009
[24] Robinson, n.d.
[25] DEC, n.d.

Table 6: Fungi recorded in Central Park

Name	Common Name	Photograph
Cortinarius ochraceofulvus	Golden Tuart Cortinarius	
Inocybe murrayana	Inocybe murrayana	
Pycnoporus coccineus	Bracket Fungi	
Scleroderma sp. (Identity unconfirmed)	Puff ball	

3.3 Plant Diseases

Organisms such as fungi, bacteria and viruses that cause plant diseases are known as pathogens. Whilst some pathogens are naturally occurring within soil populations, others have been introduced to the environment through the movement of plant materials and soils.[26] The symptoms produced by plants that are affected by pathogens vary depending upon the species of pathogen, host species, environment and climatic conditions. Some pathogens can cause rapid death of plants whilst others result in a slow, perennial decline in health. [27]

Phytophthora dieback refers to the disease caused by the introduced plant pathogen *Phytophthora*. While there are numerous species of *Phytophthora*, the most aggressive species affecting native plants throughout South-western Western Australia is *Phytophthora cinnamomi*. Whilst *Phytophthora cinnamomi* is the most common species of *Phytophthora* dieback within Western Australia a second species of *Phytophthora*, *Phytophthora multivora* is common in urban areas of the Perth, particularly along the inland dune systems, and has been identified within the City's parks areas. *Phytophthora multivora* is named due to its wide host range, including *Banksia* and Eucalypt species. *Phytophthora multivora* can cause rapid death of plants or a slow, perennial decline in health of the crown and is commonly associated with individual spot deaths and areas of tree decline.[28]

Armillaria luteobubalina has also been identified within a number of parks within the City of Joondalup. *Armillaria* is a soil-borne fungus that causes root rot of a wide variety of plants including many species of native flora. The fungus is native to Australia and can cause major damage to natural ecosystems. *Armillaria luteobubalina* is commonly known as the 'Honey Fungus' due to the colour of the fruiting body seen above the ground during certain times of the year (Figure 15). Fruiting bodies (mushrooms) are not evident at all infected sites and their presence is usually a sign that the fungus is well established in that area.[29]

Figure 15: *Armillaria luteobubalina*

[26] City of Joondalup, 2012c
[27] City of Joondalup, 2012c
[28] City of Joondalup, 2012c
[29] City of Joondalup, 2012c

At present there is no reliable mechanism for the complete eradication of *Phytophthora* species and the control of *Armillaria luteobubalina* is both expensive and labour intensive.[30]

A high level of tree mortality was observed during the site assessment; however, this most likely relates to the fire event of 2011 with no obvious symptoms of plant diseases were noted during the survey, however no soil or other sampling activities were undertaken to confirm this. The general health of the vegetation was difficult to assess due to the recent nature of the fire damage.

3.3.1 Current Management Approach

The City of Joondalup has developed a *Pathogen Management Plan* to protect native vegetation and ecosystems by establishing the level of risk for areas to be infected by pathogens, prioritisation of areas and detail preventative and management actions to be implemented within the City, including guidelines for dieback-free plant purchasing and a hygiene procedure.

3.3.2 Recommended Management Actions

To prevent pathogen spread and protect biodiversity values at Central Park, the following management actions are proposed:

Action	Detail
Pathogen Management	Implement recommendations from the *Pathogen Management Plan* that are applicable to the management of Central Park.

[30] City of Joondalup, 2012c

3.4 Fauna

Fauna surveys document the occurrence, distribution and population of fauna species. Information from fauna surveys is used as a baseline to monitor the health of fauna species.

3.4.1 Fauna Survey Methodology

The fauna survey design was aligned with *EPA Guidance Statement No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia*, the principles outlined in *EPA Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection*, and the *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment*.

Desktop Study

As part of the fauna survey, NAC reviewed data provided by City of Joondalup to compile a complete data set which has been utilised in the development of this plan. Databases searches of NatureMap, the DEC threatened fauna database and the Protected Matters Search Tool (Cwlth) were also undertaken for comparison.

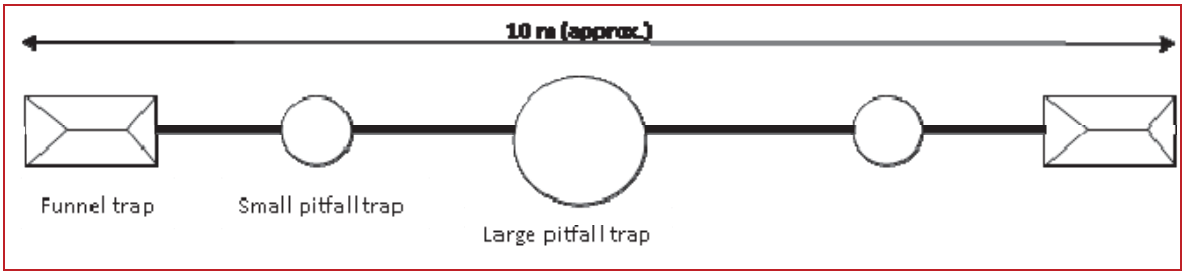
Field Survey

Natural Area Consulting undertook a fauna survey of Central Park in March-April 2012. The field survey for fauna was carried out in three components (Table 7).

Table 7: Fauna Survey Methodology

Activity	Method
Opportunistic fauna survey	The presence of fauna within the reserve was assessed opportunistically while conducting field work. Fauna were also identified through the interpretation of diggings, scats and tracks.
Targeted fauna survey	In order to record the presence of terrestrial fauna, a trapping programme was undertaken over four days (12 – 16 March 2012). This involved the setting up of 20 baited Elliot traps, 2 cage traps and 4 pitfall trap lines. The trap lines consisted of: ▪ a line of plastic to divert fauna movement ▪ 1 large pitfall trap, ▪ 2 pipe traps, and ▪ 2 funnel traps (Figure 16). Traps were installed as per DEC licence requirements and all were checked by 9am.
Night survey	A night survey was undertaken to assess the site for the presence of nocturnal fauna on 28 March 2102. This involved traversing the site for 3 hours with handheld spot lights.

Figure 16: Trap Line Layout



3.4.2 Native Fauna

Fauna and flora are interconnected in complex relationships with each other and with factors such as soil, water, climate and landscape. The decline of native fauna can cause loss of plant species and changes to ecological communities.[31]

A total of twenty eight (28) native species of vertebrate fauna were recorded of which one (1) was a mammal, twenty one (21) were birds, five (5) were reptiles and one (1) was an amphibian. A total of eight (8) introduced fauna species were recorded within Central Park. The biodiversity of the site was considered to be low with species identified typically generalists able to cope with variable environmental conditions. This probably relates to the extensive fires of 2011 reducing the habitat suitable for many species as well as contributing to habitat fragmentation.[32] A list of fauna is provided in Appendix 11 along with the approximate trapping locations.

Mammals

Despite a targeted survey and a night stalk, the Western Grey Kangaroo (*Macropus fuliginosus*) was the only mammal recorded within the boundary of Central Park. The presence of the kangaroo was identified by tracks and scats observed within the reserve. It is probable that the fresh shoots from vegetation resprouting after the recent fire events and germinating plants was attracting them to the park from nearby Lake Joondalup.

Reptiles and Amphibians

Central Park had a low diversity of reptiles for a reserve of its size. This can be related to the level of disturbance from fire. There were a total of 5 reptiles and 1 amphibian recorded during the pitfall trap survey as presented in Table 8.

[31] DSEWPC (2012)
[32] Birds Australia WA and the Perth Biodiversity Project (2003)

Table 8: Reptiles and Amphibians

Species Name	Common Name	Photograph
Cryptoblepharus plagiocephalus	Fence Skink	
Ctenotus fallens	Ctenotus	
Litoria moorei	Western Green Tree Frog	
Menetia greyii	Common Dwarf Skink	

Species Name	Common Name	Photograph
Pseudonaja affinis	Dugite	
Tiliqua rugosa	Bobtail	

A snake skin was found under a log and was presumed to be from a Dugite (*Pseudonaja affinis*) due to its size and the habitat in which it was found. The Western Green Tree Frog (*Litoria moorei*) was recorded within vegetation associated with the artificial stream. The presence of this artificially created habitat has allowed the frog to occur in this area as the park contains no natural wetlands.

Birds

Birds represented the highest diversity of vertebrate fauna found within Central Park, which is consistent with their ability to incorporate the park as part of a wider habitat range. A list of bird species identified is presented in Table 9. The species diversity of birds was low, which again can be related to the level of disturbance associated with the 2011 fires. The majority of birds were recorded in the west and southwest of the site in unburnt pockets, with only a very few animals recorded within the fire affected areas of the site.

Field observations identified the threatened Forest Red Tail Cockatoos (*Calyptorhynchus banksii naso*) to be utilising the Marri (*Corymbia calophylla*) patch in the south west of the site and a flock of the endangered Carnaby's Cockatoo (*Calyptorhynchus latirostris*) were observed flying over the site;

however the current condition of the bushland would provide little feeding opportunities for this species. These two species are listed as threatened under the *Wildlife Conservation Act 1950* (WA), while the Carnaby's Cockatoo is listed as endangered and the Forest Red-tailed Cockatoo is listed as vulnerable under the *Environmental Protection and Biodiversity Conservation Act 1999* (Cwlth). The southwest of the site is being utilised as habitat by the Nankeen Night Heron (*Nycticorax caledonicus*) with juvenile animals indicating the birds are breeding in the area, probably as a result of the artificially created wetlands and the installation of artificial bird-nesting hollows (Figure 17).

Figure 17: Nankeen Night Heron (*Nycticorax caledonicus*)

Table 9: Birds Recorded

Species	Common Name
Anas gracilis	Grey Teal
Anas superciliosa	Pacific Black Duck
Anthochaera carunculata	Red Wattle Bird
Barnardius zonarius	Australian Ringneck Parrot
Cacatua roseicapilla	Galah
Calyptorhynchus banksii naso	Forest Red Tailed Cockatoo
Calyptorhynchus latirostris	Carnaby's Cockatoo
Coracina novaehollandiae	Black Faced Cuckoo shrike
Corvus coronoides	Australian Raven
Cracticus torquatus	Grey Butcherbird
Falco longipennis	Australian Hobby
Grallina cyanoleuca	Mudlark
Gymnorhina tibicen	Magpie
Hirundo neoxena	Welcome Swallow
Lichenostomus virescens	Singing Honeyeater
Lichmera indistincta	Brown Honeyeater
Nycticorax caledonicus	Nankeen Night Heron
Pardalotus striatus	Striated Pardalote
Phylidonyris novaehollandiae	New Holland Honey Eater
Purpureicephalus spurius	Red Capped Parrot
Rhipidura leucophrys	Willie Wagtail

Invertebrates

Invertebrates play a critical role in the environment providing important ecological functions and representing the majority of global fauna species diversity (Figure 18). Central Park had a low diversity of invertebrate species, comprised mainly of generalist species. Again, the highest diversity was recorded in the unburnt pocket in the southwest of the Site (Table 10). Of particular importance was the presence of the Marbled Scorpion (*Lychas marmoreus*), which is a long lived predator that indicates a healthy local ecosystem within this pocket. The burnt areas of the site were dominated by generalist ant species including the Green-head Ant (*Rhytidoponera metallica*), with their abundance indicating reduced ecological functioning in these areas.[33]

[33] Anderson *et al* (2004)

Table 10: Invertebrate Fauna

Species	Common Name
Austracantha minax	Christmas Spider
Coptotermes Sp.	Termite Species
Cryptocheilus fabricolor	Huntsman Wasp
Cryptocheilus Sp	Unidentified wasp
Eriophora biapicata	Garden Orb Weaver
Linepithema humile	Argentine ant
Lycosa godeffroyi	Wolf spider
Myrmecia vindex	Bull Ant
Myrmeleontidae Sp.	Antlion Lace Wing
Nephila edulis	Orb Weaving Spider
Rhytidoponera metallica	Green-head Ant
Lychas marmoreus	Marbled Scorpion

Figure 18: Invertebrate Fauna

Threatened and Priority Fauna

A number of threatened and priority fauna were listed during desktop searches. The species considered to either be known to be utilising the park or have the potential to occur there are given in Table 11.

Table 11: Threatened and Priority Fauna

Name	Common Name	Conservation Status	Likelihood of Occurrence
Calyptorhynchus banksii naso	Forest Red-tailed Black Cockatoo	Schedule 1 (*Wildlife Conservation Act*), Endangered (DPaW) and Vulnerable (EPBC)	Likely
Calyptorhynchus latirostris	Carnaby's Cockatoo	Schedule 1 (*Wildlife Conservation Act*), Endangered (DPaW) and Endangered(EPBC)	Likely
Merops ornatus	Rainbow Bee-eater	Schedule 3 (*Wildlife Conservation Act*), Migratory (Japan-Australia Migratory Bird Agreement (JAMBA))	Likely
Falco peregrinus	Peregrine Falcon	Schedule 3 (*Wildlife Conservation Act*)	Potential
Apus pacificus	Fork-tailed swift	Schedule 3 (*Wildlife Conservation Act*), Migratory (Japan-Australia Migratory Bird Agreement (JAMBA))	Potential
Synemon gratiosa	Graceful Sun Moth	Priority 4 (DPaW)	Likely
Idiosoma nigrum	Shield-back Trapdoor Spider	Vulnerable (Wildlife Conservation Act), Vulnerable (EPBC)	Potential

3.4.3 Non-native Fauna

Non-native fauna impact native fauna and flora through predation, competition for food and shelter, spreading diseases and destroying habitat. These impacts can result in the diminishing or extinction of native species.[34] Non-native animals such as cats, foxes, rabbits, mice, birds, millipedes and bees inhabit the City's bushland, wetland and coastal areas.

Table 12 lists introduced fauna identified within the boundary of Central Park and potential impacts these animals may have on the biodiversity of the reserve. The management of fauna can be complex

[34] DSEWPC 2012

and as such only species that have a direct impact on biodiversity and are feasible to control are recommended for management.

Table 12: Introduced Fauna

Species	Common Name	Life Form	Impact	Management Recommended
Apis mellifera	Feral Honey Bee	Insect	Competition for resources, particularly nest hollows	Yes
Dacelo novaeguineae	Laughing Kookaburra	Bird	Predation of native reptiles	No
Gambusia holbrookii	Mosquito fish	Fish	Competition for resources	No
Oryctolagus cuniculus	European Rabbit	Mammal	Grazing of vegetation, erosion from digging and competition for resources	Yes
Streptopelia chinensis	Spotted Turtle Dove	Bird	Competition for resources	No
Streptopelia senegalensis	Laughing Turtle Dove	Bird	Competition for resources	No
Trichoglossus haematodus	Rainbow Lorikeet	Bird	Competition for resources, particularly nest hollows	No
Vulpes vulpes	European Red Fox	Mammal	Native animal predation	Yes

Mammals

The Western Grey Kangaroo (*Macropus fuliginosus*) was the only mammal recorded within the boundary of Central Park. Diggings and scats of rabbits (*Oryctolagus cuniculus*) were observed throughout the site. The presence of this animal in disturbed areas is likely to impact upon the regeneration of the reserve. Rabbits also cause erosion from diggings as well as providing a stable food source for fox populations. The presence of this introduced herbivore requires revegetation plantings to be installed with tree guards to reduce grazing pressure on seedlings.

The European Red Fox (*Vulpes vulpes*) has been attributed to the decline of fauna across the Australian continent. This animal preys upon native reptiles, birds and mammals but will supplement its diet with rubbish and plant material. The presence foxes within Central Park was noted by scats and tracks. The remains of a bird were observed within the south western pocket that could be attributed to the presence of foxes or feral cats (Figure 19). It is also likely that domestic cats and dogs visit the site; these animals also have the potential to kill and injure wildlife.

Figure 19: Remains of a Bird kill in the South western Pocket

Birds

During the site assessment 4 species of non-native birds were recorded. High numbers of Rainbow Lorikeets (*Trichoglossus haematodus*) (Figure 20) were identified within the reserve and observed utilising nest hollows. Lorikeets can be aggressive and their presence may restrict the nesting activities of native animals such as the Ringneck Parrot (*Barnardius zonarius*), Australian Shelduck (*Tadorna tadornoides*) and numerous bat species. Laughing Kookaburras (*Dacelo novaeguineae*) use Central Park as habitat. Kookaburras prey upon reptiles and, with the reduced cover of the site, has the potential to alter the species composition of lizards, snakes and amphibians. The two introduced doves (Table 12) are cosmopolitan species able to live in urban areas; these animals have only an indirect impact to the biodiversity of the reserve.

Figure 20: Rainbow Lorikeets (*Trichoglossus haematodus*)

Fish

Mosquito fish (*Gambusia holbrookii*) was the only fish species found in the artificial stream located within the landscaped parkland. Originally introduced to control mosquitoes, this species has spread throughout aquatic ecosystems displacing native fauna. Management of this fish is difficult and as this wetland is artificial, the presence of this invasive species is most likely of minimal consequence to the biodiversity of Central Park.

Invertebrates

Feral Honey Bees (*Apis mellifera*), Green-head Ant (*Rhytidoponera metallica)* and Argentine ants (*Linepithema humile*) were the only non-native invertebrates to be recorded. Feral Honey Bees have the potential to reduce the biodiversity of the site by competition for nesting hollows as well as posing a threat to public safety and the abundance of introduced ants indicates reduced ecological functioning in these areas.[35]

3.4.4 Fauna Habitat

Vegetation condition at Central Park, in terms of fauna habitat, ranges from very good to degraded. Whilst the site provides habitat for kangaroos and birds the inner metropolitan location of Central Park and its small size limits the reserves use by fauna. Its proximity to Lakeside Park and Yellagonga Regional Park means there is some opportunity for fauna movement in and out of the park.

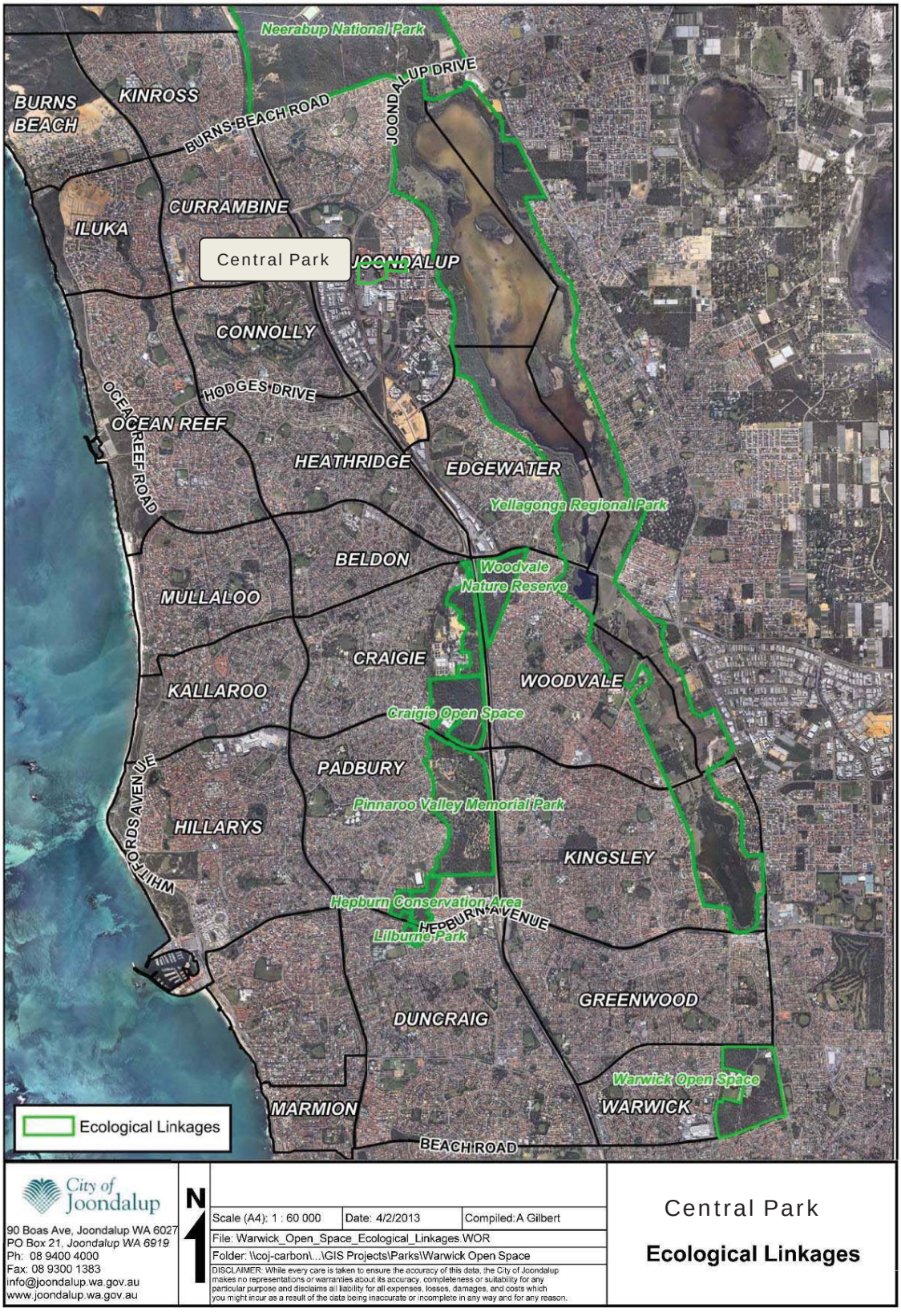
3.4.5 Ecological Corridors

Naturally connected landscapes and ecosystems are generally healthier, protect a diversity of species, provide pathways for species movement and can store carbon more effectively than degraded landscapes.[36] In urban areas where there is engineered infrastructure dividing the landscape, it may be necessary to provide wildlife crossings such as underpasses, tunnels, viaducts or overpasses to enable wildlife movement.

Central Park is a part of an ecological linkage thread, to the east is Lakeside Park, Yellagonga Regional Park, as shown in Figure 21. The presence of kangaroos in Central Park indicates that they are using this corridor to move up from Lake Yellagonga to graze on a regular basis, despite the park being fragmented from the more continuous bushland in Lakeside Park and Yellagonga Regional Park by Lakeside Drive.

[35] Anderson *et al* (2004)
[36] NWCPAG (2012)

Figure 21: Ecological Linkages to Central Park



3.4.6 Current Management Approach

The City of Joondalup is implementing a number of management actions to monitor native fauna and address the environmental impacts of domestic and pest animals within the City's natural areas. Monitoring of native fauna occurs through fauna surveys. Control of non-native fauna is undertaken annually within bushland, wetland and coastal areas. Control methods employed include biological and chemical control, trapping, baiting and exclusion methods such as fencing.

The City's current management practices have greatly reduced the incidence of pest animal populations within the City, however continued and coordinated action is required to ensure that populations remain at controllable numbers and that the impacts on natural areas remain at a minimum.

The City also promotes responsible pet ownership and encourages the community to ensure that domestic pets do not have a negative impact of the natural environment.

3.4.7 Recommended Management Actions

Detail
Remove feral bee hives (if accessible) and implement regular fox and rabbit control to reduce pressures on native fauna and flora.
To encourage fauna to utilise the site: ▪ only removing dead trees where they pose a threat to safety ▪ continue to install artificial nesting hollows ▪ provide habitat logs in areas to be revegetated ▪ installation of bat boxes.
Undertake further fauna surveys at appropriate time frames, such as every five years, to review species presence and abundance.

3.5 Social and Built Environment

3.5.1 History and Heritage

Central Park is not listed on any State or Federal Indigenous or non-Indigenous heritage inventory or register.[37]

3.5.2 Social Value

The main uses of Central Park are for purposes such as walking, dog walking or as a thoroughfare for people walking between the West Coast Institute of Training and the Joondalup central business district. The largely vegetated nature of the Central Park means that recreational opportunities are limited to passive forms, such as walking, photography and events such as weddings in the parkland area to the west.

Key external stakeholders associated with the management of Central Park include:

- West Coast Institute of Training
- DFES (formerly Fire and Emergency Services Authority (FESA))

3.5.3 Access and Infrastructure

Parking

There is no specific designated parking for Central Park but there is parking available along Grand Boulevard to the west, Lakeside Drive to the east and a parking area servicing the council offices and central business district to the north.

Fencing

Fencing is used to restrict access and protect areas of bushland. Timber post and chain mesh fencing surrounds portions of Central Park. Fencing is recommended in the location shown in Figure 22 to prevent further degradation in a portion of the bushland.

Fencing is inspected on a monthly basis and repairs are conducted as required. Minimal repairs to fences are required.

Signage

Signage is important to encourage community appreciation and inform the community of the ecological values of the site. There is currently no interpretive or educational signage within Central Park. Interpretive signage uses maps to indicate trails. Educational signage increases awareness of the ecological values of the bushland. The City is developing a *Signage Strategy* in 2013/14 to enable the provision of information and interpretive messages within the City's natural areas. The *Signage Strategy* will be used to develop and install a Bushland Signage System.

[37] Department of Indigenous Affairs (2012)

Rubbish

Central Park did not contain any significant areas of litter or rubbish dumping, with only small amounts of litter being observed within the parkland area.

Access Points

Central Park provides a high level of human access from all directions allowing the bushland to become part of the commute for people within the City of Joondalup. Three major concrete paths provide formal access:

- north from the City of Joondalup administration building down to the tertiary education facilities
- from Lakeside drive on the eastern side joining up with the north-south path
- a feed path from the war memorial park that joins the north-south path.

Paths

Paths in Central Park are used for pedestrian access, fire access ways and bushland management and maintenance purposes. The paths in Central Park are mostly used by pedestrians, dog walkers and cyclists. Access within Central Park is considered to be sufficient with no need for further tracks. The well-developed system of paths means that informal access and the formation of 'goat tracks' is not a major issue for the reserve. One informal track is located in the south western pocket with a disused limestone path located in the north eastern pocket (Figure 22). This should be controlled by installing fencing on the western side of the bush pocket (Figure 23).

Access and Inclusion

Four million Australians (20%) reported having a disability in the Survey of Disability, Ageing and Carers conducted in 2009. The study considers disability to include any impairments, activity limitations and participation restrictions which impede everyday activities for a period of at least 6 months. In 15 years time the number of West Australians with a disability is expected to increase from 1 in 5 people (20%) to 1 in 4 people (25%).

The City of Joondalup has an *Access and Inclusion Plan 2012-2014*, outlining that 'the City is committed to ensuring that its activities and services are inclusive of all members, including people with disabilities and their families or carers, and people from culturally and linguistically diverse backgrounds'. There is adequate access for people with disability to move around Central Park along the concreted pathways currently in place.

Antisocial Behaviour

There is no significant history of antisocial behaviour in the Central Park study area, with rubbish kept to a minimum and no known cubby houses having been built. Monthly inspections are carried out and issues responded to when required.

Water

There are no constructed drainage lines or stormwater sumps within Central Park. The park is on a high point in the landscape which encourages drainage away from the site. The nearest drains are installed in the road ways to the west and east (Figure 8). There is a constructed wetland on the south west side of the park that was considered to be outside the scope of this management plan.

Central Park has extensive areas of irrigated parkland. Overspray from irrigation has the potential to impact upon bushland areas adjacent to parkland by facilitating the spread of weeds and creating a dependency for an artificial water regime by native bushland plants. Excess water from the irrigation can also carry nutrients and sediment from hard surfaces into bushland pockets.

3.5.4 Recommended Management Actions

To enhance the social and built environment in Central Park, the following management actions are proposed:

Action	Detail
Install new fencing	Install new fencing around the south west bushland pocket that is currently unfenced.
Maintain fencing	Maintain fencing on an as needed basis (informed by monthly inspections) to protect the native vegetation, flora and fauna from informal access.
Investigate closure of informal tracks	Investigate closure and rehabilitation of informal track in the south-west pocket o f bushland.
Install signage	Install signage outlining the conservation significance of the site, as developed by the Signage Strategy.
Review impact of irrigation	Review the irrigation practices at the park to investigate if irrigation water is entering the study area. Modify as appropriate.

Figure 22: Access and tracks

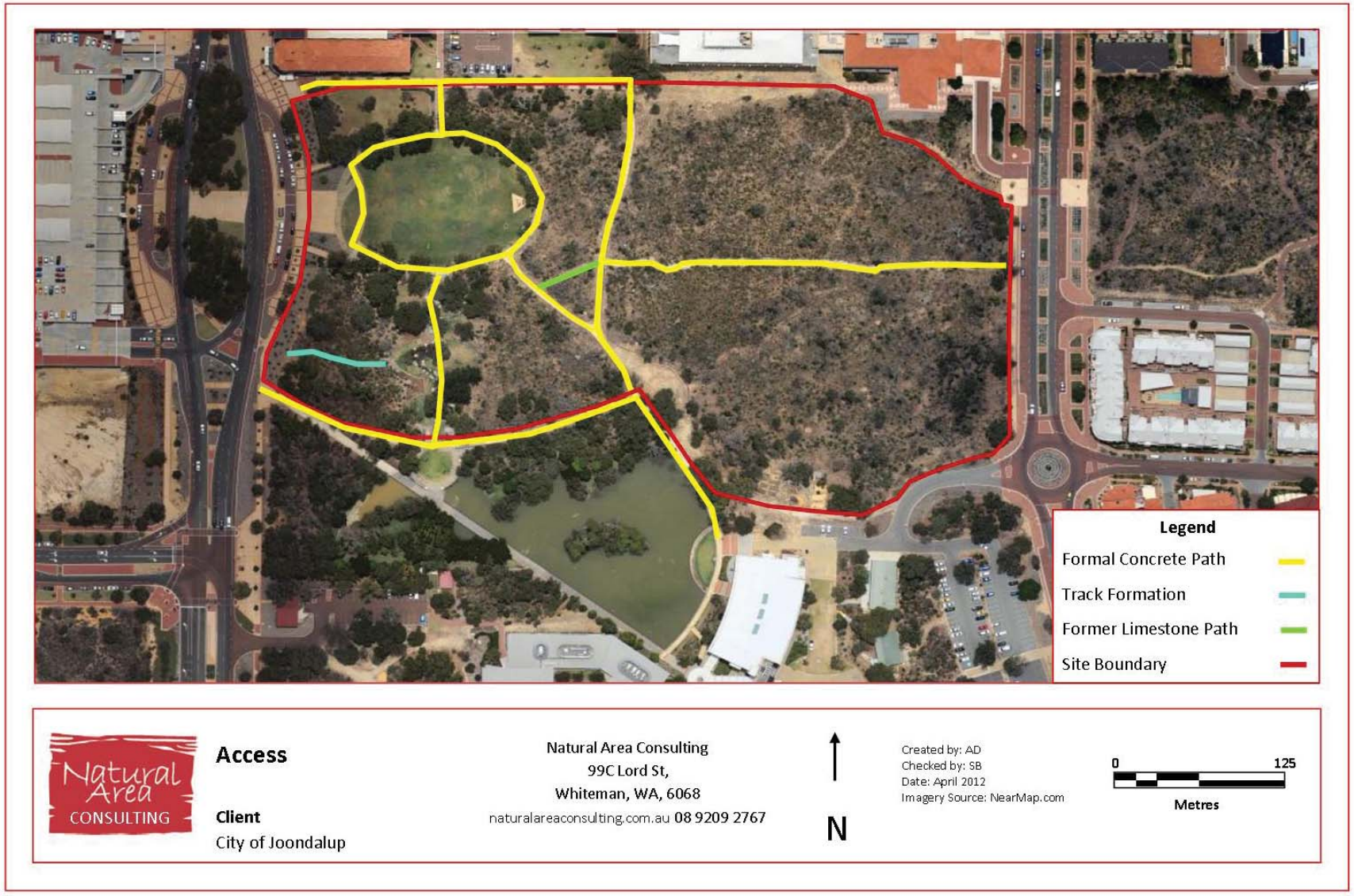
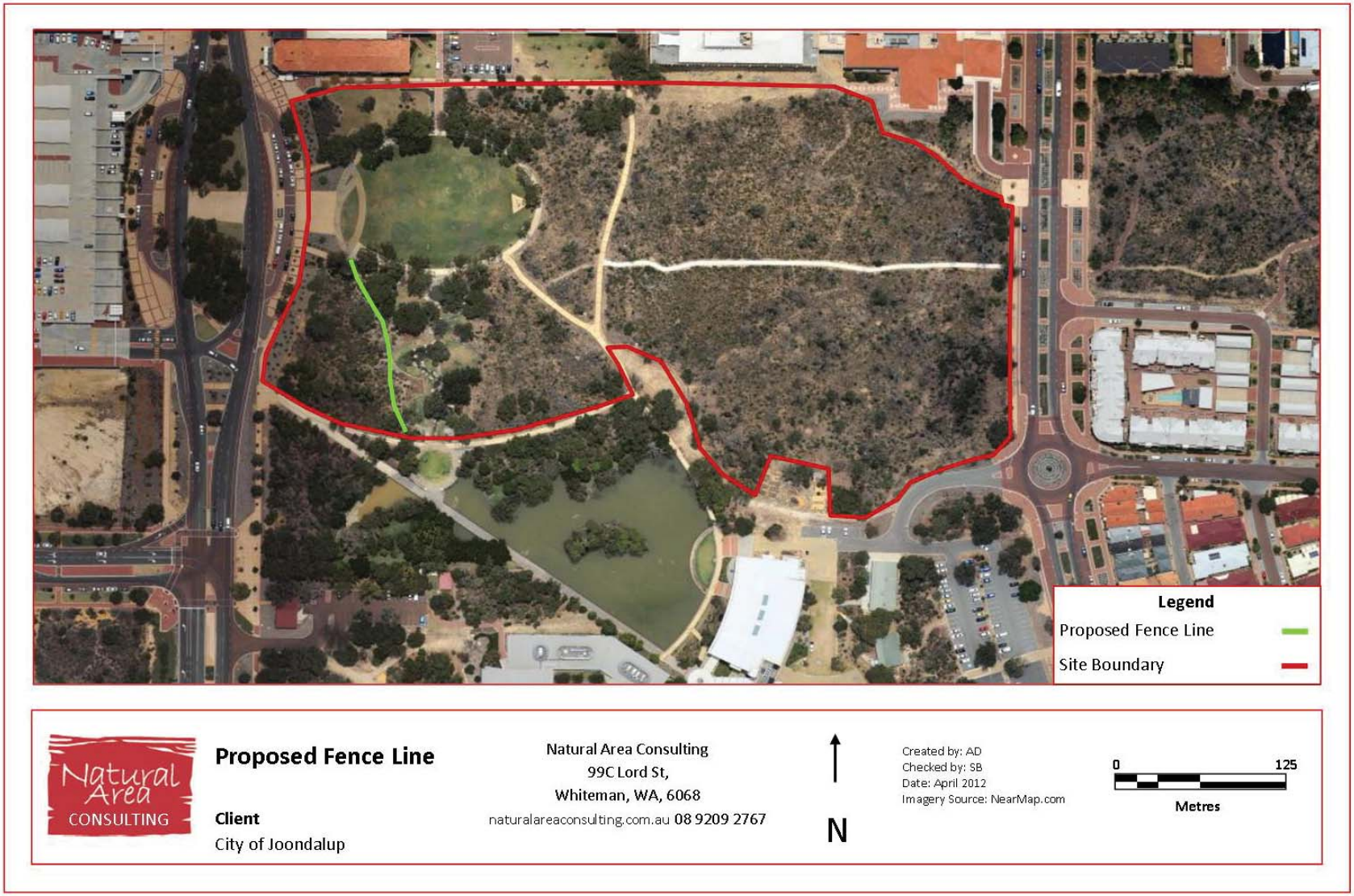


Figure 23: Proposed Fence Line



3.6 Fire Management

Fire is an important natural feature of the Western Australian landscape. Fire helps to shape the diversity of plant communities with many native plants having developed fire-related adaptations over time, for example fire expedites many species to flower or germinate. Human activity such as accidents and arson have resulted in increased incidences of fire within many urban bushland reserves, which can have a negative effect on biodiversity and encourage growth of highly flammable and invasive weeds, such as the One-leaf Cape Tulip (*Moraea flaccida*).

Bushfires are unplanned fires that can be caused by events such as lightning, planned burning operations, escape from industrial activities, damaged power transmission lines, discarded cigarette butts or deliberate arson. Bushfires can cause significant damage to people, property and the environment.[38] Management of Central Park is the responsibility of the City of Joondalup, which has a 'duty of care' to take all reasonable precautions to prevent any bushfire from spreading onto neighbouring property. The City of Joondalup does not currently have a prescribed burn management regime for the area. DFES work with the community and government to prevent, prepare for, respond to and recover from a diverse range of emergencies.[39]

Objectives

The objectives of fire management within the Central Park study area are to:

- protect life, property and environment in the central business district of Joondalup, including the council offices and civic centre, the West Coast Institute of Training and adjacent residential areas
- fulfil obligations under the *Bushfires Act 1954* (WA)
- protect the ecological and amenity values of Central Park
- protect landscape values (including flora and fauna) from uncontrolled fire and inappropriate suppression techniques
- reduce the frequency, impact and area of unplanned fires
- minimise the spread of disease and weeds during fire fighting operations and when establishing firebreaks
- minimise impacts on air quality.

Fire Risk

A fire fuel load assessment was conducted in Central Park in 2013 which indicated that the site has a moderate fuel load of 10.5 tonnes / ha. This figure is gradually increasing as the park recovers from the fires in early 2011 (Table 13) The fuel load assessment was undertaken using the methodology described in the FESA *Visual Fuel Load Guide for the Scrub Vegetation of the Swan Coastal Plain*.[40] Fuel load assessments are conducted annually at Central Park.

[38] EDOWA (2011)
[39] DFES (2013)
[40] FESA (2007)

Table 13: Fire Fuel Loads in Central Park (t/h)

2011	2012	2013
7.0	9.5	10.5

Fire Prevention

The City of Joondalup implements a number of on ground measures to reduce the risk of fire, including undertaking:

- controlled access
- non-native flora species management
- fuel load assessment and management
- maintenance and installation of fire access tracks (fire access ways and strategic firebreaks).

Weed control and maintenance of fire access tracks are conducted in accordance with the City's Annual Bushland Maintenance Schedule and Weekly Bushland Maintenance Schedules. The City of Joondalup will develop a Fire Management Plan in 2014-15, outlining the City's strategy for assessing fire risk, prevention, response and recovery. There are numerous water hydrants located around Central Park which are installed and maintained by the Water Corporation.

Fire Occurrences

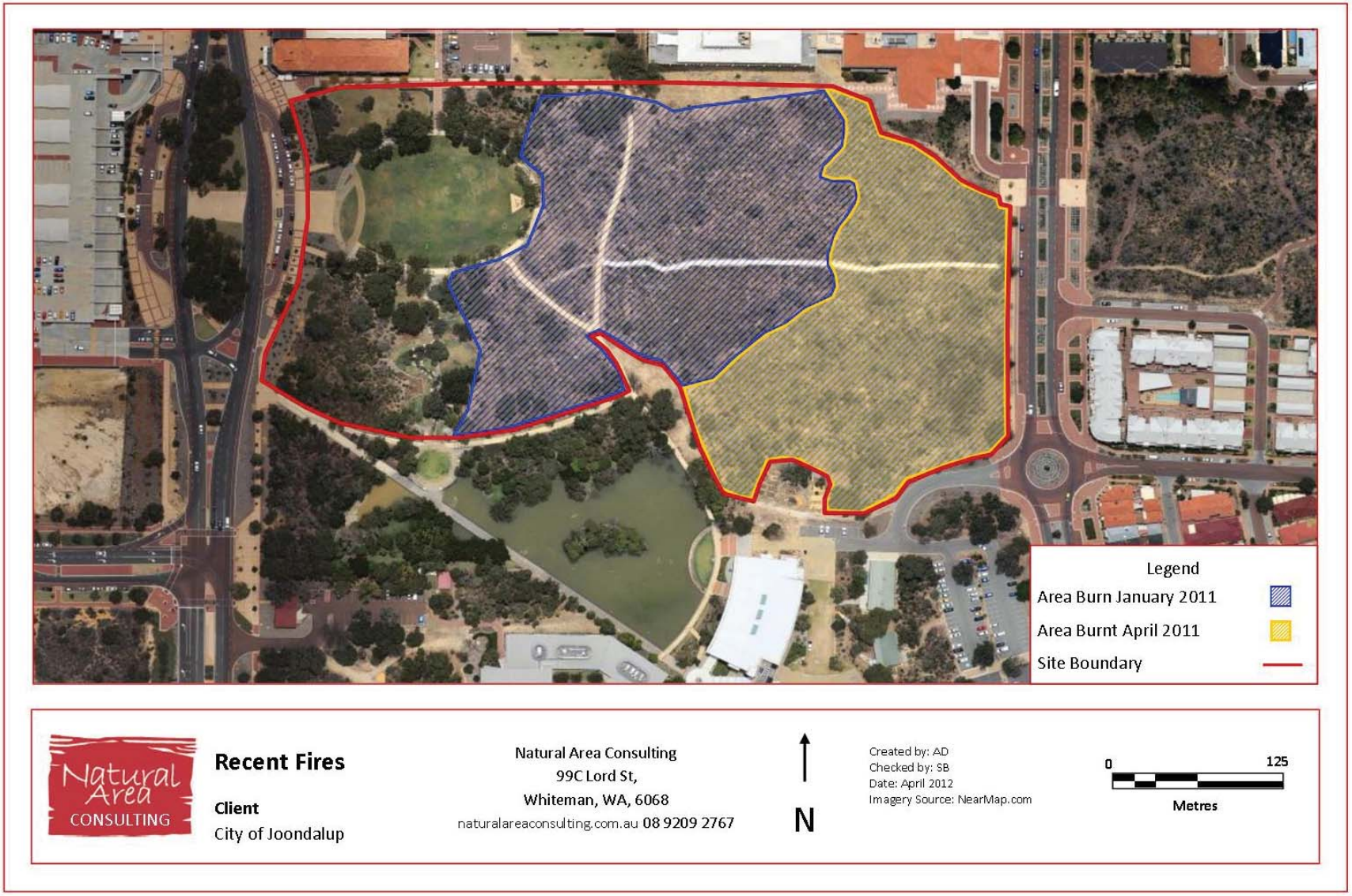
Central Park was impacted by two separate fires in January and April of 2011. The fire in January 2011 affected approximately 2 hectares with a further 2 hectares burnt in April 2011 (Figure 24).[41]

Fire Response

The closest branch of the DFES is located at the Joondalup Fire Station at 47 Drovers Place, Wanneroo, and they are responsible for suppressing fires within Central Park. The Western Australia Police are responsible for the evacuation of residents and visitors, if required.

[41] NearMap (2012)

Figure 24: Recent Fires



Fire Recovery

Weed control is revised after fire incidents to aid regrowth by selecting appropriate chemicals, targeting weeds if safe to do so for new seedlings, and spraying grasses using backpacks. Post fire regeneration across the site after the 2011 events is still in its early stages with restricted epicormic growth observed on *Eucalyptus marginata*, *Eucalyptus gomphocephala* (Figure 25) and *Corymbia calophylla*. Re-sprouting was also noted from *Xanthoria preissii*, *Calothamnus quadrifidus*, *Hakea lissocarpha* and G*revillea preissii*. Many seedlings were observed particularly *Banksia prionotes* (Figure 25) and *Banksia sessilis* as well as dense thickets of *Acacia pulchella*. Fire is a natural occurrence in Australian ecosystems; however, when they occur at a greater frequency than the vegetation can cope with and there is the potential to promote weed growth and bring about changes in the species present, which may compromise natural regeneration. For example, post fire germination since the 2011 fires shows recognised invasive environmental weed species such as *Moraea flaccida* (One-leaf Cape Tulip), *Pelargonium capitatum* (Rose Pelargonium), *Conyza bonariensis* (Fleabane) and various introduced grasses.

If the interval between fires is too short then fire-killed species will not be able to complete their lifecycle and maintain populations. Two prominent species within Central Park that respond in this way are *Banksia sessilis* and *Banksia prionotes*. Fires occurring more frequently than preferred will probably result in a significant reduction in the presence of these species. Fire also facilitates changes in vegetation structure by selecting species adapted to frequent fire events, including weeds. These species are often fast growing disturbance specialists and can form dense monocultures as seen in the high concentrations of *Acacia pulchella* in many parts of the site. Over time it is expected that a succession towards a more diverse vegetation community will take place providing the area remains unburnt for several years. Frequent fires are also likely to negatively affect the biodiversity of fauna found within Central Park due to related mortality, loss of food resources, removal of shelter from predators, and a loss of breeding habitat.

Figure 25: Epicormic Growth from Tuart (*Eucalyptus gomphocephala*) and *Banksia prionotes* Seedlings

3.6.1 Recommended Management Actions

To prevent fire occurrences and minimise the environmental impact of fire occurrences in Central Park, the following management actions are proposed

Action	Detail
Assess fire fuel load	Annually assess and report fire fuel load using the FESA *Visual Fuel Load Guide for the Scrub Vegetation of the Swan Coastal Plain* to inform fire prevention actions required.
Maintain fire access tracks and footpaths	Maintain fire access tracks and footpaths, including weed control and pruning of vegetation, by implementing Bushland Maintenance Schedules.
Develop and implement Fire Management Plan	Develop and implement a Fire Management Plan, outlining the City's strategy for assessing fire risk, prevention, response and recovery.
Monitor fire occurrences	Monitor fire occurrences through mapping and updating Geographic Information System (GIS) layers detailing fire incidents and frequency to inform fire prevention actions.
Revise weed control after fire incidents	Revise weed control after fire incidents to aid regrowth of native species by selecting appropriate chemicals or other appropriate weed control methods as a means of minimising their proliferation and outcompeting native seedlings.

3.7 Education and Training

3.7.1 Community Involvement

Historically the City has worked closely with the West Coast Institute of Training students and lecturers, it is recommended,the City approach the West Coast Instiute of Training, to progress the formation of a formal Friends of Central Park Bushland, arrangement with students and teaching staff.

3.7.2 Training and Education

The City of Joondalup Natural Areas team currently conducts plant identification training, including weed management. New members in the Natural Areas team undertake training for the identification and management of pathogens.

3.7.3 Recommended Management Actions

To increase community awareness and training opportunities regarding natural areas management, the following actions are proposed:

Action	Detail
Environmental Education Program	Implement initiatives of a 'Think Green Biodiversity' campaign (part of the Environmental Education Program) targeting environmental issues such as: ▪ pathogens ▪ weeds ▪ fire ▪ flora, fungi and fauna awareness ▪ prevention of hand feeding wildlife ▪ responsible pet ownership.
Natural Areas team training	Conduct Natural Areas team plant identification training, including weed management.
Volunteers	Investigate continued and enhanced cooperation with West Coast Institute on bushland management and training initiatives.

4.0 Implementation Plan

4.1 Auditing and Inspections

Inspections of Central Park are conducted by the City of Joondalup once every 4 weeks.

4.2 Key Performance Indicators

Key Performance Indicators are not collected for Central Park

4.3 Routine Reporting

Assessing the management of Central Park will be undertaken through annually reporting progress against management of the completion of actions.

4.4 Scientific Research and Monitoring

A Natural Areas Assessment is to be conducted on Central Park every 5 years. The most recent assessment was conducted in 2009, with the next assessment due for completion in 2014

4.5 Management Plan Review

The Central Park Management Plan is to be reviewed every 5 years. The next review is due in 2018-19.

4.6 Implementation of Management Actions

Recommended Management Action	Biodiversity Conservation Area
Undertake a follow up weed survey within the next 5 years to supplement the previous flora survey	Flora
Undertake coordinated approach to regular weed control by implementing Bushland Maintenance Schedules	Flora
Develop and implement a *City of Joondalup Weed Management Plan*	Flora
Conduct revegetation as outlined in the Revegetation Strategy	Flora
Conduct five yearly follow up of Natural Areas Initial Assessment in spring at appropriate timings	Flora
Implement recommendations from the *Pathogen Management Plan* that are applicable to the management of Central Park	Plant Diseases
Remove feral bee hives (if accessible) and implement regular fox and rabbit control to reduce pressures on native fauna and flora	Fauna
To encourage fauna to utilise the site: ▪ only removing dead trees where they pose a threat to safety ▪ installation of artificial nesting hollows ▪ provide habitat logs in areas to be revegetated ▪ installation of bat boxes	Fauna

Recommended Management Action	Biodiversity Conservation Area
Undertake further fauna surveys at appropriate time frames, such as every five years, to review species presence and abundance	Fauna
Install new fencing around the south west bushland pocket that is currently unfenced	Social and Built Environment
Maintain fencing on an as needed basis (informed by monthly inspections) to protect the native vegetation, flora and fauna from informal access	Social and Built Environment
Investigate closure and rehabilitation of informal track in the south-west pocket of bushland	Social and Built Environment
Install signage outlining the conservation significance of the site, as developed by the Signage Strategy	Social and Built Environment
Review the irrigation practices at the park to investigate if irrigation water is entering the reserve	Social and Built Environment
Annually assess and report fire fuel load using the FESA Visual Fuel Load Guide for the Scrub Vegetation of the Swan Coastal Plain to inform fire prevention actions required	Fire Management
Maintain fire access tracks and footpaths, including weed control and pruning of vegetation, by implementing Bushland Maintenance Schedules	Fire Management
Develop and implement a Fire Management Plan, outlining the City's strategy for assessing fire risk, prevention, response and recovery	Fire Management
Monitor fire occurrences through mapping and updating Geographic Information System (GIS) layers detailing fire incidents and frequency to inform fire prevention actions	Fire Management
Revise weed control after fire incidents to aid regrowth of native species by selecting appropriate chemicals or other appropriate weed control methods as a means of minimising their proliferation and outcompeting native seedlings	Fire Management
Implement initiatives of a 'Think Green Biodiversity' campaign (part of the Environmental Education Program) targeting environmental issues such as: ▪ pathogens ▪ weeds ▪ fire ▪ flora and fauna awareness ▪ prevention of hand feeding wildlife ▪ responsible pet ownership	Education and Training
Conduct Natural Areas Team weekly plant identification training, including weed management, to increase the effectiveness of weed control activities	Education and Training
The City to approach the West Coast Instiute of Training, to progress the formation of a formal Friends of Central Park Bushland, arrangement with the students and teaching staff.	Community Involvemnt

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Wildlife Conservation Act 1950 (Western Australia)

6.0 Appendices

Appendix 1: Conservation Codes (WA)

Conservation Code	Name	Description
T	Threatened	Flora or fauna that is rare or likely to become extinct (Schedule 1 of the *Wildlife Conservation Act* 1950) Taxa that have been adequately searched for and deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.
X	Presumed Extinct	Flora or fauna that is presumed to be extinct in the wild (Schedule 2 of the *Wildlife Conservation Act* 1950) Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such.
IA	International Agreement	Birds protected under international agreement (Schedule 3 of the *Wildlife Conservation Act* 1950) Birds that are subject to an agreement between governments of Australia and other countries relating to the protection of migratory birds and birds in danger of extinction
S	Specially Protected	Other specially protected fauna (Schedule 4 of the *Wildlife Conservation Act* 1950) Fauna that is in need of special protection, otherwise than for the reasons listed in other schedules of the *Wildlife Conservation Act* 1950.
Schedule 1 species that are ranked by the DEC according to their level of threat using IUCN Red List criteria		
CR	Critically endangered	Species considered to be facing an extremely high risk of extinction within the wild
EN	Endangered	Species considered to be facing a very high risk of extinction within the wild
VU	Vulnerable	Species considered to be facing a high risk of extinction in the wild
Taxa that have not been adequately surveyed for listing under Schedule 1 or 2 of the Wildlife		

Conservation Code	Name	Description
Protection Act are added to the Priority Lists under priorities 1, 2 or 3, according to the priority for further survey and evaluation of their conservation status.		
1	Priority One	Poorly known taxa Taxa which are known from one or a few collections or sight records (generally <5), on all lands not managed for conservation, such as road verges, urban areas, farmland, active mineral lease and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
2	Priority Two	Poorly known taxa Taxa which are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, such as national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves and similar. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes
3	Priority Three	Poorly known taxa Taxa that are known collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known

Conservation Code	Name	Description
		threatening processes exist that could affect them.
4	Priority Four	Rare or near threatened and other taxa in need of monitoring Rare: Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. Near threatened: Taxa that are considered to have been adequately surveyed and that to not qualify for Conservation Dependent, but that are close to qualifying for vulnerable. Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
5	Priority Five	Conservation Dependent Taxa Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxa becoming threatened within five years.

(Source: Department of Environment and Conservation, 2011)

Appendix 2: Vegetation Structural Classes

Vegetation Structural Classes				
Life Form/Height Class	**Canopy Percentage Cover**			
	100 – 70%	**70 – 30%**	**30 – 10%**	**10 – 2 %**
Trees over 30 m	Tall closed forest	Tall open forest	Tall woodland	Tall open woodland
Trees 10 – 30 m	Closed forest	Open forest	Woodland	Open woodland
Trees under 10 m	Low closed forest	Low open forest	Low woodland	Low open woodland
Tree Mallee	Closed tree mallee	Tree mallee	Open tree mallee	Very open tree mallee
Shrub Mallee	Closed shrub mallee	Shrub mallee	Open shrub mallee	Very open shrub mallee
Shrubs over 2 m	Closed tall scrub	Tall open scrub	Tall shrubland	Tall open shrubland
Shrubs 1 – 2 m	Closed heath	Open heath	Shrubland	Open shrubland
Shrubs under 1 m	Closed low heath	Open low heath	Low shrubland	Low open shrubland
Grasses	Closed grassland	Grassland	Open grassland	Very open grassland
Herbs	Closed herbland	Herbland	Open herbland	Very open herbland
Sedges	Closed sedgeland	Sedgeland	Open sedgeland	Very open sedgeland

(Source: Government of Western Australia, 2000)

Appendix 3: Vegetation Condition Rating Scale

Category	Description
1 Pristine	Pristine or nearly so, no obvious signs of disturbance.
2 Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
3 Very Good	Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
4 Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
5 Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
6 Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Appendix 4: Flora Species List

* Weed species
\# Introduced native species
(S) Significant flora species

Family	Genus and Species	*Previous Name*	Common Name	Abundance
	Class CYCADOPSIDA (Cycads)			
ZAMIACEAE	*Macrozamia fraseri*			common
	Macrozamia riedlei			common
ANGIOSPERMAE	**Class LILIOPSIDA** (Monocotyledons)			
ASPARAGACEAE	*Dichopogon capillipes*		Chocolate Lily	common
	Lomandra caespitosa			common
	Lomandra hermaphrodita			common
	Lomandra maritima			common
	Lomandra preissii			common
	Lomandra suaveolens			few
	Thysanotus arenarius			common
	Thysanotus manglesianus		Climbing Fringed Lily	
	Thysanotus sparteus			common
ASPHODELACEAE	**Asphodelus fistulosus*		Onion Weed	few
COLCHICACEAE	*Burchardia congesta*	*Burchardia umbellata*	Milkmaids	common
CYPERACEAE	**Isolepis marginata*			few
	Lepidosperma leptostachyum			few

Family	Genus and Species	*Previous Name*	Common Name	Abundance
	Lepidosperma squamatum			common
	Lepidosperma pubisquameum			common
CYPERACEAE	*Mesomelaena pseudostygia*			common
	Schoenus clandestinus			common
	Schoenus grandiflorus			common
HAEMODORACEAE	*Conostylis candicans*[#]			common
	Haemodorum paniculatum			abundant
HEMEROCALLIDACEAE	*Corynotheca micrantha*			common
	Dianella revoluta var. divaricata	*Dianella revoluta*		common
	Tricoryne elatior			common
IRIDACEAE	**Gladiolus caryophyllaceus*		Pink Gladiolus	abundant
	****Moraea flaccida***		**Cape Tulip**	**abundant**
	Patersonia occidentalis		Purple flag	common
	**Romulea rosea*		Guildford grass	common
JUNCACEAE	*Juncus pallidus*			few
	Luzula meridionalis			rare
ORCHIDACEAE	*Microtis media*		Mignonette Orchid	common
POACEAE	*Amphipogon turbinatus*			few
	Austrostipa compressa			common
	Austrostipa flavescens			common
	**Avena barbata*			common
	**Briza maxima*		Blowfly Grass	common
	**Briza minor*			
	**Ehrharta calycinus*		Perennial Veldt	common
	**Ehrharta longiflora*		Annual Veldt	common
	**Lagurus ovatus*		Hare's-tail Grass	few
	**Pentaschistis airoides*			common

Family	Genus and Species	*Previous Name*	Common Name	Abundance
	**Vulpia sp.*			common
RESTIONACEAE	*Desmocladus flexuosus*			abundant
XANTHORRHOEACEAE	*Xanthorrhoea preissii*		Balga	common
	Class MAGNOLIOPSIDA (Dicotyledons)			
AIZOACEAE	**Carpobrotus edulis*		Pigface	common
AMARANTHACEAE	**Ptilotus polystachyus*			common
APIACEAE	*Eryngium pinnatifidum*			common
	Trachymene pilosa			common
ASTERACEAE	**Cirsium vulgare*			rare
	**Conyza bonariensis*		Fleabane	common
	**Hedypnois rhagadioloides*		Cretan weed	common
	**Helichrysum luteoalbum*			common
	**Hypochaeris glabra*		Flatweed	
	**Lactuca serriola*		Prickly lettuce	common
	Olearia axillaris			rare
	Podotheca gnaphalioides			common
	**Sonchus asper*			common
	**Sonchus oleraceus*		Sowthistle	
	**Ursinia anthemoides*			common
	Waitzia suaveolens			common
BRASSICACEAE	*Brassica tournefortii*		Wild Radish	common
	**Heliophila pusilla*			rare
CAMPANULACEAE	*Wahlenbergia preissii*			common

Family	Genus and Species	*Previous Name*	Common Name	Abundance
CARYOPHYLLACEAE	**Silene gallica*			common
CASUARINACEAE	*Allocasuarina fraseriana*		Sheoak	common
	Allocasuarina humilis			common
CHENOPODIACEAE	**Chenopodium ambrosioides*			few
	Enchylaena tomentosum			few
	Rhagodia baccata			few
CRASSULACEAE	**Crassula alata*			
	**Crassula glomerata*			
DILLENIACEAE	*Hibbertia cuneiformis* (S)			few
	Hibbertia hypericoides			common
	Hibbertia racemosa			rare
DROSERACEAE	*Drosera ?menziesii*		Climbing Sundew	
	Drosera erythrorhiza		Sundew	
ERICACEAE	*Astroloma ciliata*			few
	Astroloma pallidum		Kickbush	
	Conostephium preissii			few
	Leucopogon parviflorus			common
	Leucopogon propinquus			common
	Leucopogon racemulosus			rare
EUPHORBIACEAE	**Euphorbia terracina*		Geraldton Carnation Weed	common
	Phyllanthus calycinus		False Boronia	common
FABACEAE	*Acacia cyclops*			few
	Acacia pulchella		Prickly Moses	abundant

Family	Genus and Species	*Previous Name*	Common Name	Abundance
	Acacia rostellifera			common
	Acacia saligna			common
	Acacia willdenowiana			few
	Bossiaea eriocarpa			common
	Gompholobium tomentosum			abundant
FABACEAE	*Hardenbergia comptoniana*		Native Wisteria	common
	Hovea trisperma			common
	Jacksonia calcicola			common
	Jacksonia sericea (S) P4			common
	Jacksonia sternbergiana			common
	Kennedia prostrata		Running Postman	common
	**Trifolium campestre*			common
GERANIACEAE	**Pelargonium capitatum*		Rose Pelargonium	common
GOODENIACEAE	*Lechenaultia linarioides* (S)			common
	Scaevola canescens			common
	Scaevola globulifera			common
	Scaevola repens var. *angustifolia*			common
LAURACEAE	*Cassytha racemosa*		Dodder	few
MYRTACEAE	*Agonis flexuosa*		Peppermint Tree	few
	Calothamnus quadrifidus			common
	Calothamnus sanguineus			common
	Corymbia calophylla	*Eucalyptus calophylla*	Marri	common
	Eucalyptus gomphocephala		Tuart	common
	Eucalyptus marginata		Jarrah	common
OROBANCHACEAE	**Orobanche minor*			few
PHYTOLACCACEAE	**Phytolacca octandra*		Inkweed	common

Family	Genus and Species	*Previous Name*	Common Name	Abundance
PROTEACEAE	*Banksia attenuata*			common
	Banksia grandis			few
	Banksia menziesii			few
	Banksia prionotes			common
	Banksia dallanneyi	*Dryandra lindleyana*		common
	Banksia sessilis var. cygnorum	*Dryandra sessilis*	Parrot Bush	common
PROTEACEAE	*Grevillea preissii*			common
	Hakea lissocarpha			common
	Hakea prostrata			few
	Persoonia saccata			few
	Petrophile macrostachya			few
	Petrophile axillaris	*Petrophile serruriae (S)*		rare
RANUNCULACEAE	*Clematis linearifolia*			few
	Clematis pubescens			few
RHAMNACEAE	*Spyridium globulosum*		Basket Bush	few
RUBIACEAE	*Opercularia vaginata*			common
SCROPHULARIACEAE	**Dischisma arenarium*			common
	Myoporum caprarioides			common
SOLANACEAE	*Anthocercis littorea*			common
	**Solanum nigrum*		Nightshade	common
	Solanum symonii			common
STYLIDIACEAE	*Stylidium brunonianum*			
	Stylidium junceum			
VIOLACEAE	*Hybanthus calycinus*			common

Appendix 5: Vegetation Quadrat Data

Quadrat No.:	1
Survey Date:	03/04/2012
Personnel:	Jacquie Milner, Alex Devine
GPS Coordinates:	383554.46, 6487109.46 Zone: 50
Vegetation Type:	Open Tuart Woodland
Soil:	Brown-Yellow sand
Condition:	Very Good
Notes:	

Native Species

Acacia pulchella
Acacia saligna
Astroloma pallidum
Austrostipa flavescens
Banksia dallanneyi
Banksia sessilis var. cygnorum
Bossiaea eriocarpa
Burchardia congesta
Conostylis candicans
Desmocladus flexuosa
Dianella revoluta var. divaricata
Eryngium pinnatifidum
Eucalyptus gomphocephala
Gompholobium tomentosum
Hakea lissocarpha
Hibbertia hypericoides
Leucopogon parviflorus
Leucopogon propinquus
Leucopogon racemulosa
Lomandra caespitosa
Lomandra suaveolens
Mesomelaena pseudostygia
Opercularia vaginata
Phyllanthus calycinus
Schoenus clandestinus
Tricoryne elatior
Xanthorrhoea preissii

Invasive Species

**Carpobrotus edulis*
**Gladiolus caryophyllaceus*
**Moraea flaccida*
**Romulea rosea*

Quadrat No.:	2
Survey Date:	05/04/2012
Personnel:	Jacquie Milner, Alex Devine
GPS Coordinates:	383638.92, 6487114.52 Zone: 50
Vegetation Type:	Open Tuart Woodland
Soil:	Grey-brown sand
Condition:	Good
Notes:	

Native Species

Acacia pulchella
Astroloma pallida
Austrostipa compressa
Banksia attenuata
Banksia dallanneyi
Banksia prionotes
Bossiaea eriocarpa
Burchardia congesta
Conostylis candicans
Corymbia calophylla
Desmocladus flexuosa
Dichopogon capillipes
Enchylaena tomentosum
Eryngium pinnatifidum
Eucalyptus gomphocephala
Gompholobium tomentosum
Haemodorum laxum
Hardenbergia comptoniana
Hibbertia hypericoides
Hovea trisperma
Hybanthus calycinus
Jacksonia calcicola
Jacksonia sternbergiana
Kennedia prostrata
Lechenaultia linarioides
Lepidosperma pubisquameum
Lepidosperma squamatum
Leucopogon parviflorus
Thysanotus arenarius
Thysanotus sparteus
Trachymene pilosa
Tricoryne elatior
Xanthorrhoea preissii

Invasive Species

Briza maxima
Carpobrotus edulis
Conyza bonariensis
Dischisma arenarium
Ehrharta calycinus
Gladiolus caryophyllaceus
Helichrysum luteoalbum
Hypochaeris glabra
Moraea flaccida

Leucopogon propinquus
Lomandra hermaphrodita
Lomandra maritima
Luzula meridionalis
Mesomelaena pseudostygia
Scaevola canescens
Scaevola repens var angustifolia
Orobanche minor
Pelargonium capitatum
Romulea rosea
Solanum nigrum
Ursinia anthemoides

Quadrat No.: 3
Survey Date: 03/04/2012
Personnel: Jacquie Milner, Alex Devine
GPS Coordinates: 383652.75, 6487214.23 Zone: 50
Vegetation Type: Open Tuart Woodland
Soil: Brown-grey sand
Condition: Good
Notes:

Native Species
Acacia pulchella
Acacia saligna
Austrostipa compressa
Banksia attenuata
Banksia sessilis var. cygnorum
Bossiaea eriocarpa
Burchardia congesta
Conostylis candicans
Corynotheca micrantha
Desmocladus flexuosa
Dianella revoluta var. divaricata
Eryngium pinnatifidum
Gompholobium tomentosum
Haemodorum laxum
Hakea prostrata
Hibbertia hypericoides
Jacksonia sternbergiana
Kennedia prostrata
Lechenaultia linarioides
Lepidosperma squamatum
Leucopogon parviflorus

Invasive Species
Briza maxima
Carpobrotus edulis

Lomandra caespitosa	*Conyza bonariensis*
Lomandra hermaphrodita	*Ehrharta calycinus*
Lomandra maritima'	*Gladiolus caryophyllaceus*
Mesomelaena pseudostygia	*Hedypnois rhagadioloides*
Petrophile macrostachya	*Moraea flaccida*
Scaevola canescens	*Orobanche minor*
Schoenus grandiflorus	*Romulea rosea*
Solanum symonii	
Thysanotus sparteus	
Tricoryne elatior	
Xanthorrhoea preissii	

Quadrat No.:	4
Survey Date:	03/04/2012
Personnel:	Jacquie Milner, Alex Devine
GPS Coordinates:	383634.71, 6487075.12 Zone: 50
Vegetation Type:	Open Marri Forest
Soil:	Dark Brown sand
Condition:	Good
Notes:	

Native Species

Acacia pulchella
Banksia attenuata
Banksia menziesii
Corymbia calophylla
Desmocladus flexuosa
Dichopogon capillipes
Eryngium pinnatifidum
Eucalyptus marginata
Gompholobium tomentosum
Haemodorum laxum
Hakea lissocarpha
Hibbertia hypericoides
Hibbertia racemosa
Hovea trisperma

Kennedia prostrata
Lepidosperma squamatum
Lomandra preissii
Luzula meridionalis
Mesomelaena pseudostygia
Myoporum caprarioides
Petrophile macrostachya
Phyllanthus calycinus
Xanthorrhoea preissii

Invasive Species
**Briza maxima*
**Carpobrotus edulis*
**Cirsium vulgare*
**Conyza bonariensis*
**Ehrharta longiflora*
**Ehrharta calycinus*
**Euphorbia terracina*
**Gladiolus caryophyllaceus*
**Hypochaeris glabra*
**Lactuca serriola*
**Moraea flaccida*
**Romulea rosea*
**Solanum nigrum*
**Sonchus oleraceus*

Quadrat No.: 5
Survey Date: 03/04/2012
Personnel: Jacquie Milner, Alex Devine
GPS Coordinates: 383827.96, 6487093.14 Zone: 50
Vegetation Type: Open Marri Forest
Soil: Brown-yellow sand
Condition: Good
Notes:

Native Species
Acacia pulchella
Acacia saligna
Banksia attenuata
Corymbia calophylla
Desmocladus flexuosa
Dichopogon capillipes
Eucalyptus marginata

Gompholobium tomentosum
Haemodorum laxum
Hardenbergia comptoniana
Hibbertia hypericoides
Hovea trisperma
Jacksonia calcicola
Jacksonia sternbergiana
Lomandra caespitosa
Macrozamia fraseri
Scaevola repens var. angustifolia
Xanthorrhoea preissii

Invasive Species
**Carpobrotus edulis*
**Conyza bonariensis*
**Ehrharta longiflora*
**Gladiolus caryophyllaceus*
**Hedypnois rhagadioloides*
**Moraea flaccida*
**Pelargonium capitatum*
**Phytolacca octandra*
**Romulea rosea*
**Solanum nigrum*
**Sonchus oleraceus*
**Ursinia anthemoides*

Quadrat No.:	6
Survey Date:	03/04/2012
Personnel:	Jacquie Milner, Alex Devine
GPS Coordinates:	383803.22, 6487128.89 Zone: 50
Vegetation Type:	Jarrah Woodland
Soil:	Grey-brown sand
Condition:	Good
Notes:	

Native Species

Acacia pulchella
Acacia saligna
Amphipogon turbinatus
Austrostipa compressa
Banksia attenuata
Banksia dallanneyi
Banksia sessilis var. cygnorum
Bossiaea eriocarpa
Burchardia congesta
Conostylis candicans
Desmocladus flexuosa
Dianella revoluta var. divaricata
Dichopogon capillipes
Eryngium pinnatifidum
Eucalyptus marginata
Gompholobium tomentosum
Haemodorum laxum
Hakea lissocarpha
Hibbertia hypericoides
Jacksonia sericea
Jacksonia sternbergiana
Kennedia prostrata
Lepidosperma leptostachyum
Leucopogon propinquus
Lomandra hermaphrodita
Lomandra suaveolens
Mesomelaena pseudostygia
Opercularia vaginata
Scaevola canescens
Scaevola globulifera
Schoenus clandestinus
Thysanotus sparteus
Tricoryne elatior
Waitzia suaveolens
Xanthorrhoea preissii

Invasive Species
**Briza minor*
**Carpobrotus edulis*
**Conyza bonariensis*
**Ehrharta calycinus*
**Gladiolus caryophyllaceus*
**Hedypnois rhagadioloides*
**Hypochaeris glabra*
**Moraea flaccida*
**Orobanche minor*
**Pelargonium capitatum*
**Solanum nigrum*
**Ursinia anthemoides*

Quadrat No.:	7
Survey Date:	03/04/2012
Personnel:	Jacquie Milner, Alex Devine
GPS Coordinates:	383820.69, 6487175.88

	Zone: 50
Vegetation Type:	Jarrah Woodland
Soil:	Grey-Brown sand
Condition:	Good
Notes:	

Native Species

Acacia pulchella
Austrostipa compressa
Banksia attenuata
Banksia sessilis var. cygnorum
Burchardia congesta
Calothamnus quadrifidus
Corynotheca micrantha
Desmocladus flexuosa
Eryngium pinnatifidum
Gompholobium tomentosum
Haemodorum laxum
Hakea lissocarpha
Hibbertia hypericoides
Hovea trisperma
Hybanthus calycinus
Jacksonia calcicola
Lechenaultia linarioides
Lomandra hermaphrodita
Mesomelaena pseudostygia
Opercularia vaginata
Podotheca gnaphalioides
Scaevola canescens
Scaevola repens var. angustifolia
Solanum symonii
Thysanotus arenarius
Waitzia suaveolens
Xanthorrhoea preissii

Invasive Species

**Briza maxima*
**Briza minor*
**Carpobrotus edulis*
**Conyza bonariensis*
**Gladiolus caryophyllaceus*
**Hedypnois rhagadioloides*
**Hypochaeris glabra*
**Moraea flaccida*
**Orobanche minor*
**Romulea rosea*
**Ursinia anthemoides*

Quadrat No.:	8
Survey Date:	03/04/2012
Personnel:	Jacquie Milner, Sharon Hynes
GPS Coordinates:	383737.59, 6487193.57 Zone: 50
Vegetation Type:	Limestone Heath
Soil:	Brown-yellow sand
Condition:	Good
Notes:	

Native Species

Acacia pulchella
Austrostipa compressa
Austrostipa flavescens
Banksia dallanneyi
Banksia sessilis var. cygnorum
Burchardia congesta
Conostylis candicans
Desmocladus flexuosa
Dianella revoluta var. divaricata
Gompholobium tomentosum
Grevillea preissii
Haemodorum laxum
Hakea lissocarpha
Hibbertia hypericoides
Lechenaultia linarioides
Lepidosperma pubisquameum
Lomandra caespitosa
Lomandra maritima
Mesomelaena pseudostygia
Podotheca gnaphalioides
Scaevola canescens
Scaevola globulifera
Scaevola repens var. angustifolia
Thysanotus sparteus
Xanthorrhoea preissii

Invasive Species

**Carpobrotus edulis*
**Gladiolus caryophyllaceus*
**Heliophila pusilla*
**Moraea flaccida*
**Romulea rosea*
**Ursinia anthemoides*

Quadrat No.:	9
Survey Date:	03/04/2012
Personnel:	Jacquie Milner, Alex Devine
GPS Coordinates:	383711.03, 6487128.85 Zone: 50
Vegetation Type:	Limestone Heath
Soil:	Brown-yellow sand
Condition:	Very Good
Notes:	

Native Species

Acacia pulchella
Austrostipa compressa
Austrostipa flavescens
Banksia dallanneyi
Banksia sessilis var. cygnorum
Burchardia congesta
Calothamnus quadrifidus
Conostylis candicans
Desmocladus flexuosa
Dianella revoluta var. divaricata
Gompholobium tomentosum
Grevillea preissii
Haemodorum laxum
Hakea lissocarpha
Hibbertia hypericoides
Jacksonia sericea
Lechenaultia linarioides
Lepidosperma pubisquameum
Leucopogon parviflorus
Lomandra hermaphrodita
Lomandra maritima
Mesomelaena pseudostygia
Myoporum caprarioides
Opercularia vaginata
Scaevola canescens
Scaevola repens var. angustifolia
Thysanotus arenarius
Xanthorrhoea preissii

Invasive Species

**Briza maxima*
**Briza minor*
**Gladiolus caryophyllaceus*
**Moraea flaccida*
**Orobanche minor*
**Ursinia anthemoides*

Quadrat No.:	10
Survey Date:	05/04/2012
Personnel:	Jacquie Milner, Alex Devine
GPS Coordinates:	383659.40, 6487171.51 Zone: 50
Vegetation Type:	Limestone Heath
Soil:	Brown-yellow sand
Condition:	Good
Notes:	

Native Species

Acacia pulchella
Austrostipa compressa
Austrostipa flavescens
Banksia attenuata
Banksia dallanneyi
Banksia grandis
Banksia menziesii
Banksia sessilis var. cygnorum
Bossiaea eriocarpa
Burchardia congesta
Calothamnus quadrifidus
Conostylis candicans
Desmocladus flexuosa
Dianella revoluta var. divaricata
Gompholobium tomentosum
Grevillea preissii
Haemodorum laxum
Hakea lissocarpha
Hibbertia hypericoides
Hovea trisperma
Hybanthus calycinus
Jacksonia calcicola
Kennedia prostrata
Lechenaultia linarioides
Lepidosperma pubisquameum
Lomandra caespitosa
Lomandra maritima
Mesomelaena pseudostygia
Opercularia vaginata
Tricoryne elatior
Xanthorrhoea preissii

Invasive Species

**Briza maxima*
**Carpobrotus edulis*
**Ehrharta calycinus*
**Gladiolus caryophyllaceus*
**Lactuca serriola*
**Moraea flaccida*
**Ursinia anthemoides*

Phyllanthus calycinus
Podotheca gnaphalioides
Scaevola canescens
Scaevola repens var. angustifolia
Thysanotus arenarius
Thysanotus sparteus

Quadrat No.: 11
Survey Date: 5/04/2012
Personnel: Jacquie Milner, Alex Devine
GPS Coordinates: 383753.62, 6487091.09 Zone: 50
Vegetation Type: Jarrah Woodland
Soil: Brown-yellow sand
Condition: Good
Notes:

Native Species
Acacia pulchella
Agonis flexuosa
Allocasuarina fraseriana
Austrostipa compressa
Bossiaea eriocarpa
Burchardia congesta
Calothamnus quadrifidus
Conostylis candicans
Corynotheca micrantha
Desmocladus flexuosa
Dichopogon capillipes
Eucalyptus marginata
Gompholobium tomentosum
Haemodorum laxum
Hakea lissocarpha
Hardenbergia comptoniana
Hibbertia hypericoides
Hovea trisperma
Jacksonia sternbergiana
Kennedia prostrata
Lechenaultia linarioides
Lepidosperma squamatum

Invasive Species
**Briza maxima*
**Briza minor*
**Carpobrotus edulis*

Leucopogon propinquus	**Conyza bonariensis*
Lomandra caespitosa	**Gladiolus caryophyllaceus*
Lomandra hermaphrodita	**Hedypnois rhagadioloides*
Macrozamia fraseriana	**Hypochaeris glabra*
Mesomelaena pseudostygia	**Isolepis marginata*
Patersonia occidentalis	**Moraea flaccida*
Scaevola canescens	**Pentaschistis airoides*
Scaevola repens var. angustifolia	**Phytolacca octandra*
Solanum symonii	**Solanum nigrum*
Thysanotus sparteus	**Ursinia anthemoides*
Trachymene pilosa	
Xanthorrhoea preissii	

Appendix 6: Species Quadrat Matrix

Genus and Species	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
Acacia cyclops											
Acacia pulchella	X	X	X	X	X	X	X	X	X	X	X
Acacia rostellifera											
Acacia saligna	X		X		X	X					
Acacia willdenowiana											
Agonis flexuosa											X
Allocasuarina fraseriana											X
Allocasuarina humilis											
Amphipogon turbinatus						X					
Anthocercis littorea											
**Asphodelus fistulosus*											
Astroloma pallidum		X									
Astroloma ciliata											
Austrostipa compressa		X	X			X	X	X	X	X	X
Austrostipa flavescens	X							X	X	X	
**Avena barbata*											
Banksia attenuata		X	X	X		X				X	
Banksia dallanneyi	X	X				X		X	X	X	
Banksia grandis										X	
Banksia menziesii				X						X	
Banksia prionotes		X									
Banksia sessilis var cygnorum	X		X			X	X	X	X	X	
Bossiaea eriocarpa	X	X	X			X				X	X
Brassica tournefortii											
**Briza maxima*		X	X	X		X	X		X	X	X

**Briza minor*							X		X		X
Burchardia congesta	X		X			X	X	X	X	X	X
Calothamnus quadrifidus							X		X	X	X
Calothamnus sanguineus											
Genus and Species	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**	**Q11**
**Carpobrotus edulis*	X	X	X	X	X	X	X	X		X	X
Cassytha racemosa											
**Chenopodium ambrosioides*											
**Cirsium vulgare*				X							
Clematis linearifolia											
Clematis pubescens											
Conostephium preissii											
*Conostylis candicans**	X	X	X			X		X	X	X	X
**Conyza bonariensis*		X	X	X	X	X	X				X
Corymbia calophylla		X		X	X						
Corynotheca micrantha			X				X				X
**Crassula alata*											
**Crassula glomerata*											
Desmocladus flexuosus	X	X	X	X	X	X	X	X	X	X	X
Dianella revoluta var. divaricata	X		X			X		X	X	X	
Dichopogon capillipes		X		X	X	X					X
**Dischisma arenarium*		X									
Drosera ?menziesii											
Drosera erythrorhiza											
Enchylaena tomentosum		X									
**Ehrharta calycinus*		X	X	X		X				X	
**Ehrharta longiflora*				X	X						
Eryngium pinnatifidum	X	X	X	X		X	X				

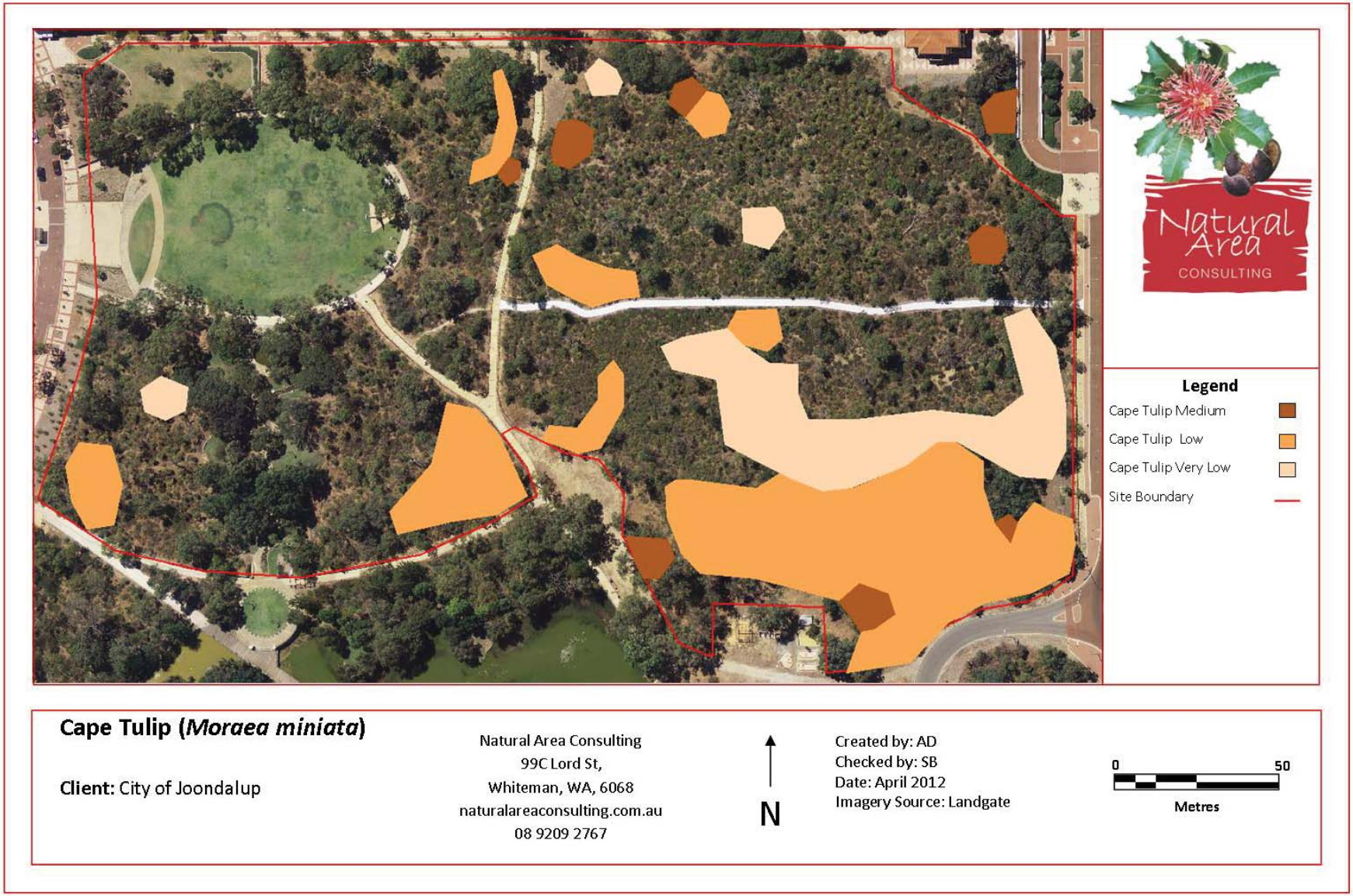
Eucalyptus gomphocephala	X	X									
Eucalyptus marginata				X	X	X					X
**Euphorbia terracina*				X							
Gompholobium tomentosum	X	X	X	X	X	X	X	X	X	X	X
**Gladiolus caryophyllaceus*	X	X	X	X	X	X	X	X	X	X	X
Grevillea preissii								X	X	X	
Haemodorum paniculatum		X	X	X	X	X	X	X	X	X	X
Hakea lissocarpha	X			X		X	X	X	X	X	X
Genus and Species	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**	**Q11**
Hakea prostrata			X								
Hardenbergia comptoniana		X			X						X
**Hedypnois rhagadioloides*			X		X	X					X
Hibbertia cuneiformis (S)											
Hibbertia hypericoides	X	X	X	X	X	X	X	X	X	X	X
Hibbertia racemosa				X							
**Helichrysum luteoalbum*		X									
**Heliophila pusilla*								X			
Hovea trisperma		X		X	X		X			X	X
Hybanthus calycinus		X					X			X	
**Hypochaeris glabra*		X		X		X	X				
**Isolepis marginata*											X
Jacksonia calcicola		X			X		X			X	
Jacksonia sericea (S)						X			X		
Jacksonia sternbergiana		X	X		X	X					X
Juncus pallidus											
Kennedia prostrata		X	X	X		X				X	X
**Lactuca serriola*				X						X	
**Lagurus ovatus*											

Lechenaultia linarioides (S)		X	X				X	X	X	X	X
Lepidosperma leptostachyum						X					
Lepidosperma pubisquameum		X						X	X	X	
Lepidosperma squamatum		X		X							X
Lepidosperma sp.											
Leucopogon parviflorus	X	X	X						X		
Leucopogon propinquus	X	X				X					X
Leucopogon racemulosus	X										
Lomandra caespitosa	X		X		X			X		X	X
Lomandra hermaphrodita		X	X			X	X		X		X
Lomandra maritima		X	X					X	X	X	
Lomandra preissii				X							
Genus and Species	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**	**Q11**
Lomandra suaveolens	X					X					
Luzula meridionalis		X		X							
Macrozamia fraseri					X						
Macrozamia riedlei											
Mesomelaena pseudostygia	X	X	X	X		X	X	X	X	X	X
Microtis media											
**Moraea flaccida*	X	X	X	X	X	X	X	X	X	X	X
Myoporum caprarioides				X					X		
Olearia axillaris											
Opercularia vaginata	X					X	X		X	X	
**Orobanche minor*		X	X			X	X		X		
**Pelargonium capitatum*		X			X	X					
Patersonia occidentalis											X
**Pentaschistis airoides*											X
Persoonia saccata											

Petrophile macrostachya			X	X							
Petrophile axillaris											
Phyllanthus calycinus	X			X						X	
**Phytolacca octandra*					X						X
Podotheca gnaphalioides							X	X		X	
**Ptilotus polystachyus*											
Rhagodia baccata											
**Romulea rosea*	X	X	X	X	X		X	X			
Scaevola canescens		X	X			X	X	X	X	X	X
Scaevola globulifera						X		X			
Scaevola repens var angustifolia		X			X		X	X	X	X	X
Schoenus clandestinus	X										
Schoenus grandiflorus			X								
**Silene gallica*											
**Solanum nigrum*		X		X	X	X					X
Solanum symonii			X				X				X
Genus and Species	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**	**Q11**
**Sonchus asper*											
**Sonchus oleraceus*				X	X						
Spyridium globulosum											
Stylidium brunonianum											
Stylidium junceum											
Thysanotus arenarius		X					X		X	X	
Thysanotus manglesianus											
Thysanotus sparteus		X	X			X		X		X	X
Trachymene pilosa		X									X
Tricoryne elatior	X	X	X			X				X	
**Trifolium campestre*											

**Ursinia anthemoides*		X			X	X	X	X	X	X	X
**Vulpia sp.*											
Wahlenbergia preissii											
Waitzia suaveolens						X	X				
Xanthorrhoea preissii	X	X	X	X	X	X	X	X	X	X	X

Appendix 7: Weed Maps


Natural Area CONSULTING
Legend
Cape Tulip Medium
Cape Tulip Low
Cape Tulip Very Low
Site Boundary
Cape Tulip (Moraea miniata)
Client: City of Joondalup
Natural Area Consulting
99C Lord St,
Whiteman, WA, 6068
naturalareaconsulting.com.au
08 9209 2767
N
Created by: AD
Checked by: SB
Date: April 2012
Imagery Source: Landgate
0
50
Metres

Asteraceae Weeds (Daises)

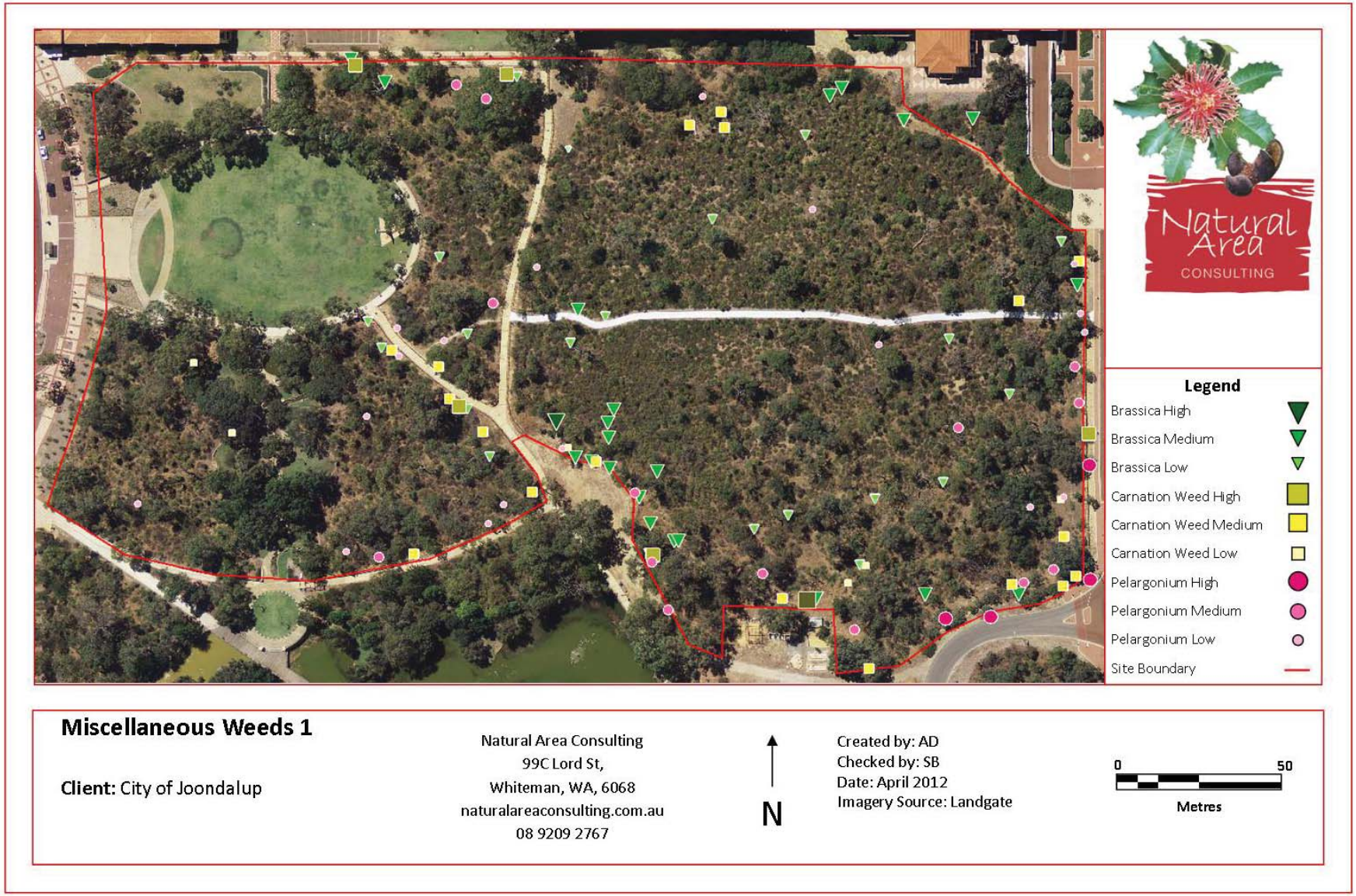
Client: City of Joondalup

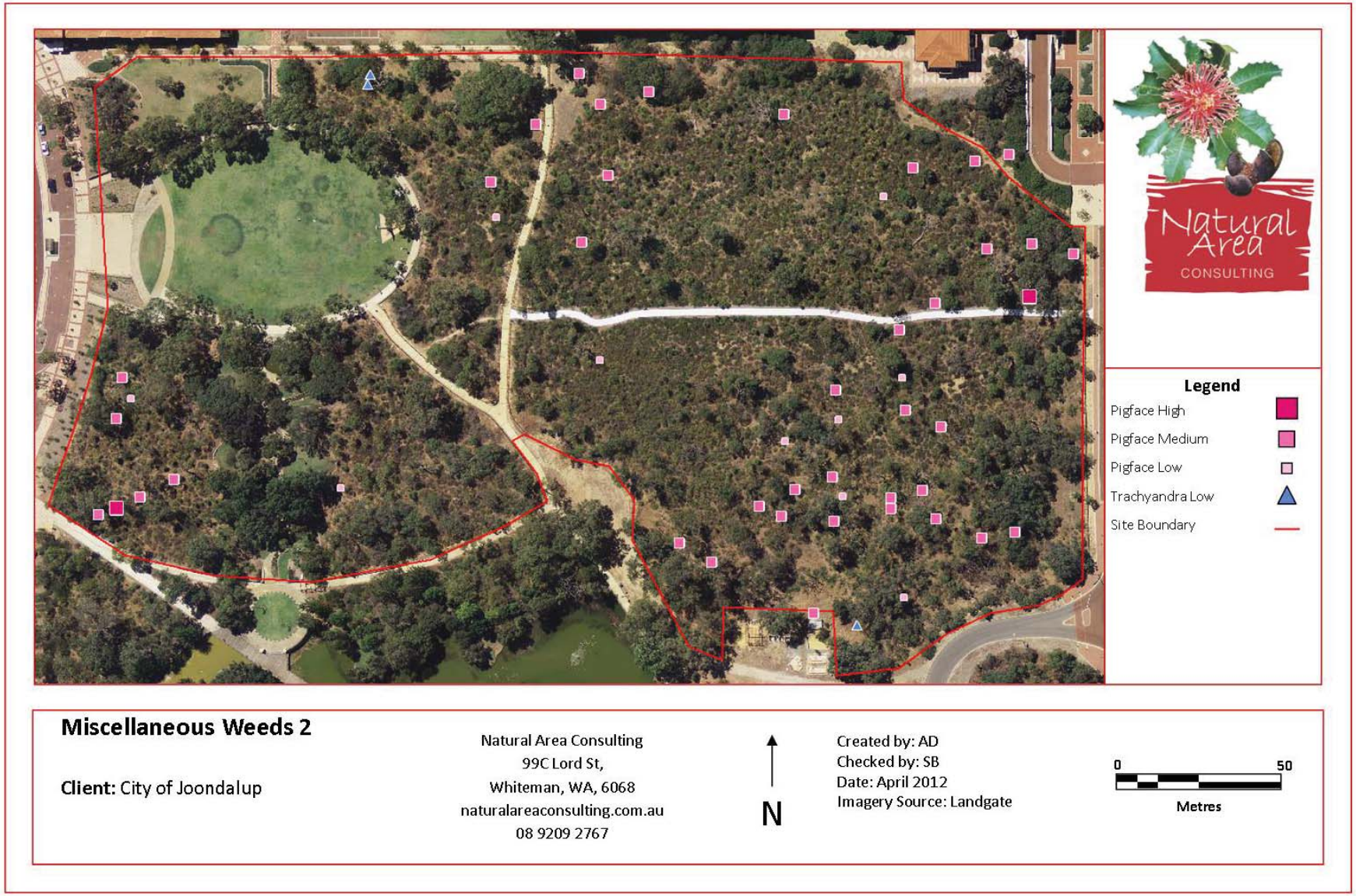
Natural Area Consulting
99C Lord St,
Whiteman, WA, 6068
naturalareaconsulting.com.au
08 9209 2767

N

Created by: AD
Checked by: SB
Date: April 2012
Imagery Source: Landgate

0 50
Metres




Natural Area
CONSULTING
Legend
Pigface High
Pigface Medium
Pigface Low
Trachyandra Low
Site Boundary
Miscellaneous Weeds 2
Client: City of Joondalup
Natural Area Consulting
99C Lord St,
Whiteman, WA, 6068
naturalareaconsulting.com.au
08 9209 2767
N
Created by: AD
Checked by: SB
Date: April 2012
Imagery Source: Landgate
0
50
Metres

Perennial Grasses

Client: City of Joondalup

Natural Area Consulting
99C Lord St,
Whiteman, WA, 6068
naturalareaconsulting.com.au
08 9209 2767

N

Created by: AD
Checked by: SB
Date: April 2012
Imagery Source: Landgate

0 50
Metres

Natural Area CONSULTING

Legend

Gladiolus Low

Gladiolus Very Low

Site Boundary

Pink Gladiolus

(*Gladiolus caryophyllaceus*)

Client: City of Joondalup

Natural Area Consulting
99C Lord St,
Whiteman, WA, 6068
naturalareaconsulting.com.au
08 9209 2767

N

Created by: AD
Checked by: SB
Date: April 2012
Imagery Source: Landgate

0 50

Metres


Natural Area
CONSULTING
Legend
Annual Veldt Medium
Annual Veldt Low
Annual Veldt Very Low
Oats Medium
Oat Low
Oats Very Low
Site Boundary
Annual Grasses
Client: City of Joondalup
Natural Area Consulting
99C Lord St,
Whiteman, WA, 6068
naturalareaconsulting.com.au
08 9209 2767
N
Created by: AD
Checked by: SB
Date: April 2012
Imagery Source: Landgate
0
50
Metres

Appendix 8: Weed Control Methodology

Weed treatment types and methods are provided below. Treatment rates were taken from the recommended rates from off label permit no. 13333 issued by the Australian Pesticides and Veterinary Medicines Authority (2012), Southern Weeds[42] and Flora base.[43] The following Tables provides an indication of the recommended weed treatment according to species present within Central Park. Note that the spraying of Metsulfuron is not recommended in the Park due to its residual effect in the soil and associated death of non-target species.[44]

Treatment Types

Treatment Number	Treatment Type	Targeted Species	Application Method and Comments
1	Glyphosate	Annual and perennial grass and broadleaf weeds	Spot spray – non-selective
2	Quizalofop	Annual and perennial grasses	Spot spray or overall spray in broad leaf host situations
3	Metsulfuron glove/sponge wipe	One-leaf Cape Tulip	Wipe Leaves with sponge prior to or just on flowering
4	Triclopyr or picloram	Woody weeds and trees	Cut and paint or basal bark
5	Hand weeding	Carnation Weeds, Fleabane, Pigface, and similar	Gloves required due to caustic sap of Carnation Weed

(Source: Australian Pesticides and Veterinary Medicines Authority, 2012)

Weed Control Methodology

Species	Common Name	Treatment Number	Timing
Asphodelus fistulosus	Onion Weed	1	August - September
Avena barbata	Bearded oats	1 or 2	July - October
Brassica tournefortii	Mediterranean Turnip	1	June – August
Briza maxima	Blowfly Grass	2	June - September
Carpobrotus edulis	Pigface	1 and 5	June - October
Chenopodium ambrosioides	Goosefoot	1	June – August
Cirsium vulgare	Spear Thistle	1	June - August
Conyza bonariensis	Fleabane	1 and 5	June –September
Dittrichia graveolens	Stinkwort	1	September - November
Ehrharta calycina	Perennial Veldt	2	June - August (prior to flower formation)
Ehrharta longiflora	Annual Veldt	2	June - August (prior to flower formation)
Euphorbia terracina	Geraldton Carnation Weed	1, 5	June - August

[42] Moore and Wheeler (2008)
[43] DPaW (2012)
[44] Armstrong (2012)

Species	Common Name	Treatment Number	Timing
Gladiolus caryophyllaceus	Pink Gladiolus	1, 3 or 5	July - September
Lactuca serriola	Prickly Lettuce	1	September - November
Lagurus ovatus	Hares Tail Grass	2	June-October
Moraea flaccida	One-Leaf Cape Tulip	3	August - September
Olea europaea subsp. europaea	Olive	4	March-May and Oct-Dec
Pelargonium capitatum	Rose Pelargonium	1	May - September
Pennisetum clandestinum	Kikuyu	1 or 2	Year Round
Pentaschistis airoides	False Hairgrass	2	June - August
Phytolacca octandra	Inkweed	1	June – August (prior to fruiting)
Ricinus communis	Castor Oil	1, 4	September - December
Romulea rosea	Guilford/Onion Grass	1 or 3	August - September
Sonchus asper	Sowthistle	1	May - September
Silene gallica	Catch Fly	2	June - August
Solanum nigrum	Nightshade	1 or 5	manual: June - November; Herbicide: July-December
Trifolium campestre	Hop Clover	1	August - September
Ursinia anthemoides	Ursinia	1	June – August
Vulpia sp.	Fescue	2	June – August

Control of One-leaf Cape Tulip (*Moraea Flaccida*)

The One-leaf Cape Tulip is difficult to control as the corms can stay dormant for many years and, as such, a targeted long term approach should be taken to control. Following the fires of 2011, Cape Tulip numbers increased. Very good control has been achieved, wiping the leaves with Metsulfuron. This is the recommended future method of control. It is also suggested that the same control method be trialled to control Pink Gladiolus (*Gladiolus caryophyllaceous).*

Appendix 9: Weed Priority Ratings

Species	Common Name where applicable	ESWA Priority Rating	DEC Swan Region Environmental Weed List			NAC Recommended Treatment Priority
			Ecological Impact H: high M: medium L: low U: unknown	Rate of dispersal R: rapid M: moderate S: slow	General trend D: decreasing S: stable I: increasing U: unknown	
Avena barbata	Bearded Oats	Moderate	H	R	I	High
Brassica tournefortii	Mediterranean Turnip	High	U	R	I	High
Briza maxima	Blowfly Grass	Moderate	H	R	I	Moderate
Carpobrotus edulis	Pigface	Moderate	H	S	U	High
Chenopodium ambrosioides	Goosefoot	Low	U	R	I	Low
Cirsium vulgare	Slender Thistle	Moderate	U	R	I	Moderate
Conyza bonariensis	Fleabane	Low	L	M	I	Moderate
Cynodon dactylon	Couch	Moderate	H	R	I	Moderate
Dittrichia graveolens	Stinkwort	Mild	M	R	I	Moderate
Ehrharta calycina	Perennial Veldt	High	H	R	S	High
Ehrharta longiflora	Annual Veldt	Low	H	R	S	High
Euphorbia terracina	Geraldton Carnation Weed	High	H	R	I	High
Fumaria capreolata	Fumaria	Mild	H	R	I	High
Gladiolus caryophyllaceous	Pink Gladiolus	Moderate	H	M	I	Moderate

Species	Common Name where applicable	ESWA Priority Rating	DEC Swan Region Environmental Weed List			NAC Recommended Treatment Priority
			Ecological Impact H: high M: medium L: low U: unknown	Rate of dispersal R: rapid M: moderate S: slow	General trend D: decreasing S: stable I: increasing U: unknown	
Lactuca serriola	Prickly Lettuce	Moderate	H	R	I	Moderate
Lagurus ovatus	Hare's-tail Grass	High	H	R	S	Moderate
Moraea flaccida	One-leaf Cape Tulip	High	H	R	I	High priority
Olea europaea subsp. europaea	Olive	Unavailable	H	R	I	Moderate
Pelargonium capitatum	Rose Pelargonium	High	H	R	I	High
Pennisetum clandestinum	Kikuyu	Unavailable	H	S	I	Moderate
Pentaschistis airoides	False Hairgrass	Moderate	U	R	I	Moderate
Phytolacca octandra	Inkweed	Mild	U	M	I	Moderate
Raphanus raphanistrum	Wild radish	Mild	U	M	I	High
Ricinus communis	Castor Oil	Low	M	R	I	High
Romulea rosea	Guilford/Onion Grass	High	U	R	I	Low
Silene gallica	Catch Fly	Low	L	M	I	Low
Solanum nigrum	Nightshade	Moderate	M	R	I	High
Sonchus asper	Sowthistle	Moderate	U	R	S	Low
Trifolium campestre	Hop Clover	Moderate	U	U	I	Low
Ursinia anthemoides	Ursinia	Moderate	U	R	I	Moderate
Vicia sativa	Vetch	Moderate	U	U	I	Moderate
Vulpia sp.	Fescue	Moderate	H	R	I	High

Source: CALAM (1999), DEC (2009), DEC (2011)

Appendix 10: Recommended Revegetation Strategy for Central Park

Revegetation activities within Central Park will serve to complement the sites natural post fire regeneration processes. Restoration will focus on the peripheral areas of the site which are unlikely to have a sufficient capacity for natural regeneration owing to a lack of native species. Areas recommended for restoration are identified as zones 1-4 with suggested implementation schedules provided in Section 9.0.

Plant densities are recommended at a rate of between 1 - 0.5 plant per m^2, depending on the amount of vegetation present within the nominated zone. Plants should be sourced from local provenance stock and from an accredited nursery to lower the risk of introducing pathogens into the reserve. Plants should be installed with a native fertiliser tablet and protected with tree guards to discourage herbivores.

Zone 1 Revegetation

This area is located adjacent to parkland and is characterised by having a depleted understorey with little or no native species. The area would benefit from revegetation in providing connectivity between the two bush pockets and reducing the available area for weed invasion.

Stage 1 revegetation area with grass treatment already commenced

Zone 2 Revegetation

This section is located in the north western bush pocket and is characterised by a relatively healthy over storey but a depleted understorey. This area receives high volumes of foot traffic, so revegetation would improve the visual amenity of the site as well as improving habitat for a range of fauna species.

Zone 3 Revegetation

This area is located in the northern pocket adjacent to the council buildings. Currently this part of the site has few native species and has a high abundance of weeds. It is recognised that an appropriate buffer of around 20 m with a low fire fuel loading will need to be maintained for fire safety between the vegetation and buildings.

Zone 4 Revegetation

Zone 4 contains an old limestone path that runs across the bush pocket. This path would need to be removed in order to facilitate planting of the area. Species selected for this zone include some disturbance specialist species such as *Acacias* to cope with adverse conditions and to assist with promoting an appropriate ecological succession over time.

Zone 4 Revegetation Area with Old Limestone Path

Revegetation Species List

A complete revegetation list for zones 1-4 is presented in the following tables; each species has been allocated a form identifying its growth habit. The revegetation areas should receive 1 year of weed treatment prior to planting with the exception of zone 1 which can be planted immediately. Plants should be installed with tree guards to protect them from herbivores and a native fertiliser tablet. Plants have been selected according to current site conditions and the vegetation type in which the revegetation zone is located.

Zone 1 Revegetation Species List – 1 Plant per m^2

Species	Form	Plant Numbers
Acacia pulchella	Medium shrub	100
Acacia saligna	Tree	100
Allocasuarina fraseriana	Tree	50
Allocasuarina humilis	Large Shrub	50
Anigozanthos manglesii	Small Clumping	50
Bossiaea eriocarpa	Small Shrub	100
Calytrix fraseri	Medium shrub	100

Species	Form	Plant Numbers
Corymbia calophylla	Tree	50
Dianella revoluta	Medium Clumping	50
Eucalyptus gomphocephala	Tree	50
Eucalyptus marginata	Tree	50
Gastrolobium capitatum	Small Shrub	50
Gompholobium tomentosum	Small Shrub	50
Hakea varia	Medium Shrub	200
Hardenbergia comptoniana	Ground Cover	100
Hibbertia hypericoides	Medium shrub	100
Jacksonia furcellata	Medium shrub	100
Kennedia prostrata	Ground Cover	200
Patersonia occidentalis	Medium Clumping	50
Scholtzia involucrata	Small Shrub	50
Xanthorrhoea preissii	Medium shrub	40
	Total	**1690**

Zone 2 Revegetation Species List – 1 Plant 2 m^2

Species	Form	Plant Numbers
Acacia pulchella	Small Shrub	50
Acacia saligna	Tree	50
Austrostipa compressa	Small Clumping	50
Banksia dallanneyi	Small Shrub	50
Banksia sessilis	Large Shrub	50
Bossiaea eriocarpa	Small Shrub	50
Bossiaea eriocarpa	Small Shrub	50
Calothamnus lateralis	Medium shrub	40
Conostylis aculeata	Small Clumping	40
Dianella revoluta	Medium Clumping	50
Eucalyptus gomphocephala	Tree	40
Gompholobium tomentosum	Small Shrub	40
Hakea lissocarpha	Medium shrub	50
Hakea varia	Large Shrub	40
Hardenbergia comptoniana	Ground Cover	40
Hibbertia hypericoides	Medium shrub	20
Hovea trisperma	Small Shrub	40
Jacksonia furcellata	Shrub Low	50
Jacksonia sternbergiana	Large Shrub	50
Kennedia prostrata	Ground Cover	100
Xanthorrhoea preissii	Medium shrub	40
	Total	**990**

Zone 3 Revegetation Species List 1 Plant per m^2

Species	Form	Plant Numbers
Acacia pulchella	Small Shrub	50
Acacia saligna	Tree	50
Austrostipa compressa	Small Clumping	100
Banksia dallanneyi	Small Shrub	100
Banksia sessilis	Shrub Large	200
Bossiaea eriocarpa	Small Shrub	40
Calothamnus lateralis	Medium shrub	100
Dianella revoluta	Medium Clumping	50
Eucalyptus marginata	Tree	40
Gompholobium tomentosum	Small Shrub	100
Hakea lissocarpha	Medium shrub	50
Hakea varia	Shrub Low	40
Hardenbergia comptoniana	Ground Cover	40
Hibbertia hypericoides	Medium shrub	20
Hovea trisperma	Small Shrub	40
Hypocalymma angustifolium	Medium shrub	40
Jacksonia furcellata	Shrub Low	50
Jacksonia sternbergiana	Shrub Low	50
Kennedia prostrata	Ground Cover	40
Xanthorrhoea preissii	Medium shrub	40
	Total	**1290**

Zone 4 Revegetation Species List – 1 Plant per 2 m^2

Species	Form	Plant Numbers
Acacia pulchella	Small Shrub	50
Acacia saligna	Tree	20
Austrostipa compressa	Small Clumping	50
Banksia attenuata	Tree	20
Banksia sessilis	Large Shrub	50
Bossiaea eriocarpa	Small Shrub	40
Calothamnus lateralis	Medium shrub	20
Conostylis aculeata	Small Clumping	40
Dianella revoluta	Medium Clumping	40
Eucalyptus marginata	Tree	40
Gompholobium tomentosum	Small Shrub	40
Hakea lissocarpha	Medium shrub	30
Hakea varia	Shrub Low	40
Hardenbergia comptoniana	Ground Cover	50
Hemiandra pungens	Ground Cover	20
Hibbertia hypericoides	Medium shrub	40

Species	Form	Plant Numbers
Jacksonia furcellata	Large Shrub	50
Jacksonia sternbergiana	Large Shrub	50
Kennedia prostrata	Ground Cover	50
Kunzea glabrescens	Shrub Low	50
Xanthorrhoea preissii	Medium shrub	20
	Total	**810**

Monitoring and Success Criteria

In order to monitor the success of the management strategies, monitoring in relation to set criteria may be undertaken. It is recommended in order to be cost effective, regular monitoring take place every six months for a five year period and take into account the following aims:

- an aim of 75% survival rates for plantings
- improved species diversity
- noticeable growth rates of plantings
- weed coverage to be less than 20%
- weed species to comprise less than 10% of the total species composition
- no woody weeds to be present on site.

Implementation Schedule

A recommended implementation schedule is provided below containing the works set out in Appendix 11. The schedule is set up for rehabilitation works to commence in the spring of 2013 with completion of works in 2017.

Year 1 (2013)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Glyphosate Spray												
Quizalofop Spray												
Triclopyr or picloram												
Hand Weeding												
Revegetation Zone 1												
Informal monitoring												
Fence Installation												

Year 2 (2014)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Glyphosate Spray												
Quizalofop Spray												
Triclopyr or picloram												
Hand Weeding												
Revegetation Zone 1 (Infill)												
Revegetation Zone 2												
Revegetation Zone 3												
Informal monitoring												

Year 3 (2015)

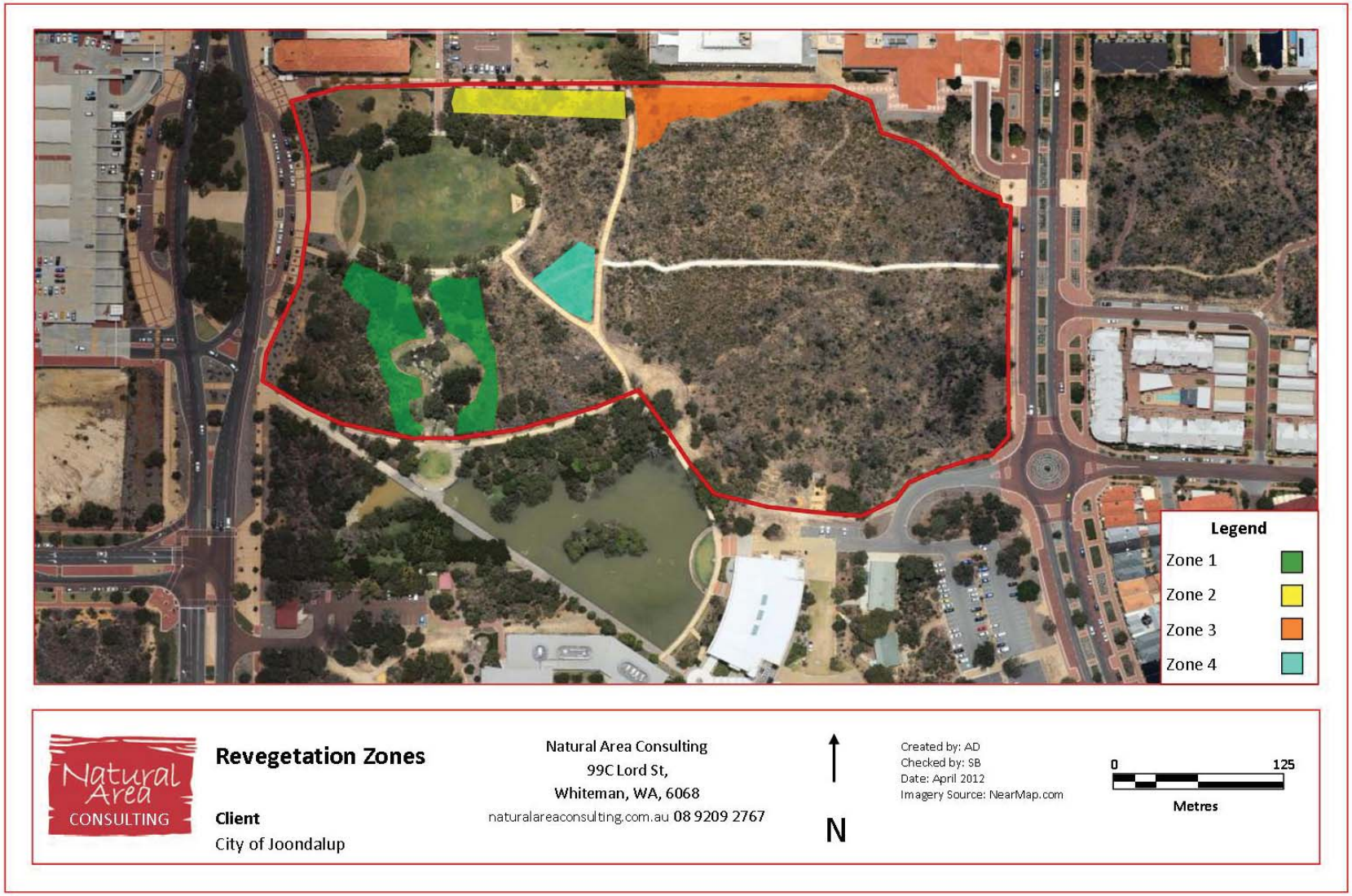
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Glyphosate Spray												
Quizalofop Spray 100g/L												
Triclopyr or picloram												
Hand Weeding												
Revegetation Zone 2 (Infill)												
Revegetation Zone 3 (Infill)												
Revegetation Zone 4												
Informal monitoring												

Year 4 (2016)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Glyphosate Spray												
Quizalofop Spray 100g/L												
Triclopyr or picloram												
Hand Weeding												
Revegetation Zone 4 (Infill)												
Informal monitoring												

Year 5 (2017)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Glyphosate Spray												
Quizalofop Spray 100g/L												
Triclopyr or picloram												
Hand Weeding												
Revegetation Zone 2,3,4 (Infill as required)												
Informal monitoring												

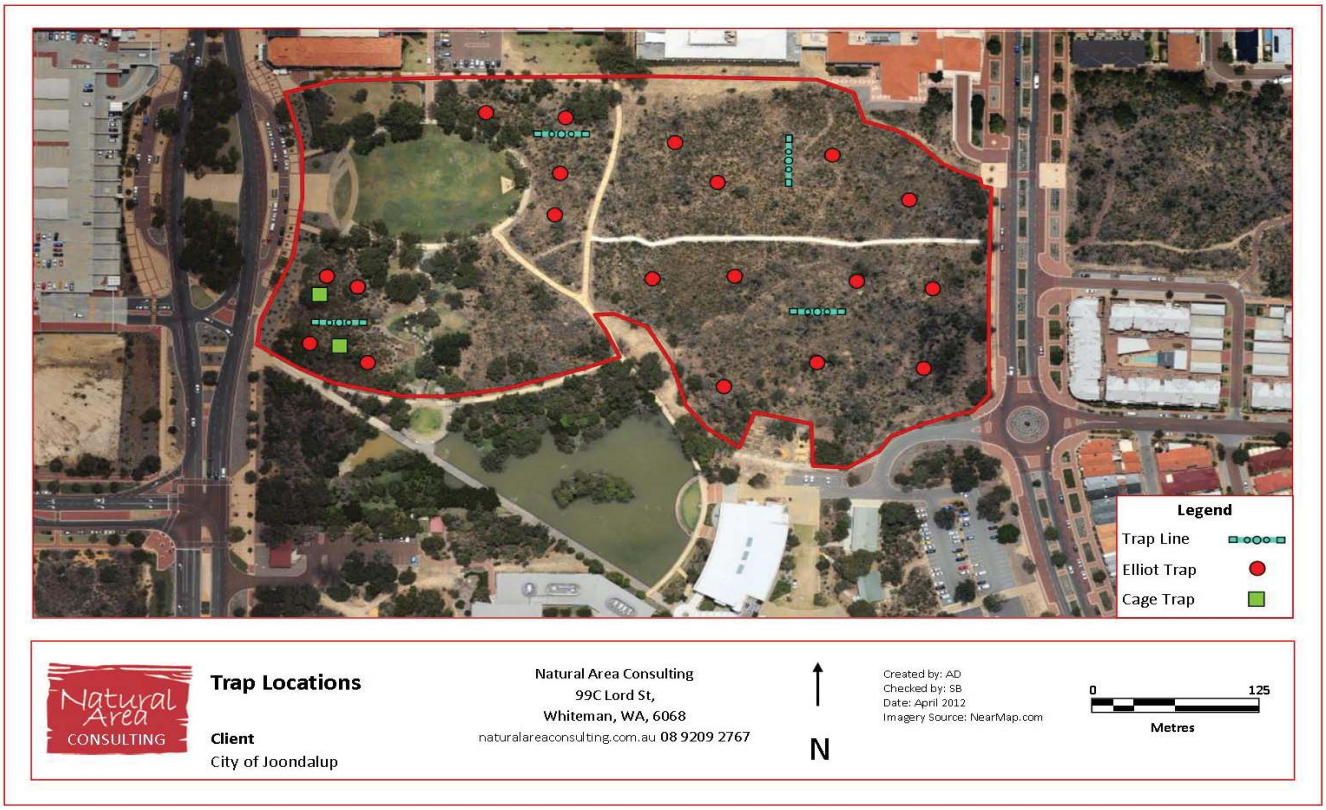


Revegetation Zones

Appendix 11: Fauna List and Trap Locations

Fauna Identified		Introduced	Threatened Species
Species Name	Common Name		
Invertebrates			
Apis mellifera	Feral Honey Bee		
Austracantha minax	Christmas Spider		
Coptotermes Sp.	Termite Species		
Cryptocheilus fabricolor	Huntsman Wasp		
Cryptocheilus Sp	Unidentified wasp		
Eriophora biapicata	Garden Orb Weaver		
Linepithema humile	Argentine ant		
Lychas marmoreus	Marbled Scorpion		
Lycosa godeffroyi	Wolf spider		
Myrmecia vindex	Bull Ant		
Myrmeleontidae Sp.	Antlion Lace Wing		
Nephila edulis	Orb Weaving Spider		
Rhytidoponera metallica	Green-head Ant		
Fish			
Gambusia holbrookii	Mosquito fish		
Reptiles			
Cryptoblepharus plagiocephalus	Fence Skink		
Ctenotus fallens	Ctenotus		
Litoria moorei	Western Green Tree Frog		
Menetia greyii	Common Dwarf Skink		
Pseudonaja affinis	Dugite		
Tiliqua rugosa	Bobtail		
Birds			
Anas gracilis	Grey Teal		
Anas superciliosa	Pacific Black Duck		
Anthochaera carunculata	Red Wattle Bird		
Barnardius zonarius	Australian Ringneck Parrot		
Cacatua roseicapilla	Galah		
Calyptorhynchus banksii naso	Forest Red Tailed Cockatoo		State and Federal listing
Calyptorhynchus latirostris	Carnaby's Cockatoo		State and Federal listing
Coracina novaehollandiae	Black Faced Cuckoo Shrike		
Corvus coronoides	Australian Raven		
Cracticus torquatus	Grey Butcherbird		
Dacelo novaeguineae	Laughing Kookaburra		
Falco longipennis	Australian Hobby		

Fauna Identified		Introduced	Threatened Species
Species Name	**Common Name**		
Grallina cyanoleuca	Mudlark		
Gymnorhina tibicen	Magpie		
Hirundo neoxena	Welcome Swallow		
Lichenostomus virescens	Singing Honeyeater		
Lichmera indistincta	Brown Honeyeater		
Nycticorax caledonicus	Nankeen Night Heron		
Pardalotus striatus	Striated Pardalote		
Phylidonyris novaehollandiae	New Holland Honey Eater		
Purpureicephalus spurius	Red Capped Parrot		
Rhipidura leucophrys	Willie Wagtail		
Streptopelia chinensis	Spotted Turtle Dove		
Streptopelia senegalensis	Laughing Turtle Dove		
Trichoglossus haematodus	Rainbow Lorikeet		
Mammals			
Macropus fuliginosus	Western Grey Kangaroo		
Oryctolagus cuniculus	European Rabbit		
Vulpes vulpes	European Red Fox		



Trap Location